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Electrical World

McGraw-Hill Company, Inc. New York, February 25, 1922 Twenty-five Cents a Copy

The first of a
series of advertisements
to be run in this magazine.

The First Commercial Application of the Dynamo Electric Machine

The first commercial application of the dynamo electric machine was in 1859 when an alternator, known as the Alliance, was used to furnish electric energy to two arc lamps in the South Foreland Lighthouse on the coast of England.

As is usually the case with radically new developments, the earliest dynamos were not pushed commercially. The world was not ready, so the art of generating electricity stood still for more than 20 years. Then under the stimulus of developments in electric lamps, it revived and grew by leaps and bounds to its present high state of perfection.

Suitable electric lighting devices supplied the *need* for improved commercial methods of generating electricity, but without proper means for measuring the electric energy furnished by these wonderful machines, no commercial development of the industry of producing and marketing electric energy would have been possible.

The Sangamo Electric Company was a pioneer in the developments of commercially satisfactory meters, and by its continued efforts has helped the central station industry in solving one of its basic and most vital problems.

The first electric dynamo, invented by Michael Faraday in 1831, was a direct-current machine of the disk type and operated on the same principle as the Sangamo Mercury type meter. In 1832 Dal Negro and Pixii invented the first alternating-current machine. Numerous other types followed. The earliest machines were all equipped with permanent magnets; in 1838 Page substituted the electro magnet. In 1841 Woolrich invented the first multipolar machine. Self-excitation was first employed by Jacob Brett in 1848. In the 20 years between 1830 and 1850, more than 30 machines were developed but the first machine to come into commercial use was the Alliance which was installed in the two lighthouses comprising "The South Foreland Light" shown above. This machine was the combined development of Messrs. Nollet, Holmes, Masson and DuMoncel.

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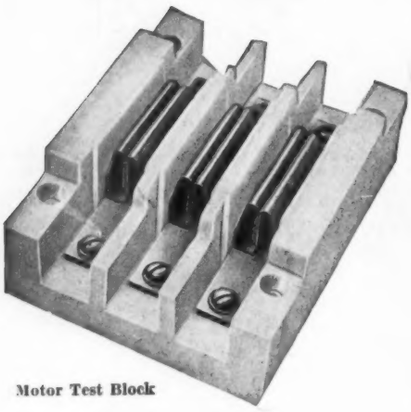

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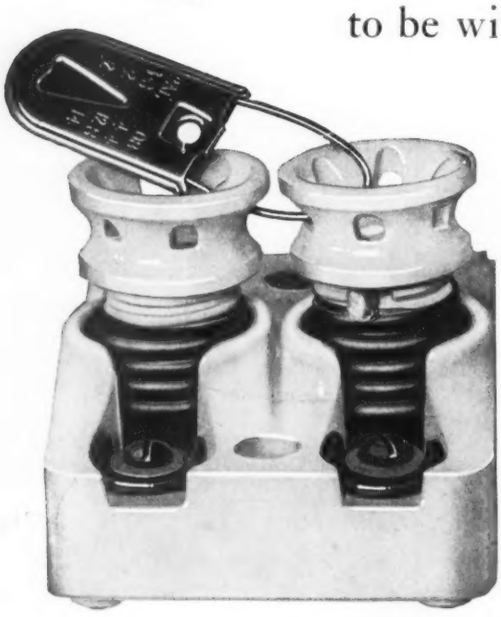

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Electrical World

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The Hobbles of Fear Are Off

AFTER all the lawyer talk about trade associations, punctured periodically by more mysterious court decisions, the publication of Secretary Hoover's correspondence with the Attorney-General comes as a refreshing surprise. On top of months of negative argument and worry over what *cannot* be done, here at last we have a list of things that *can* be done. Allah be praised! Let's go to work.

True, the legal mind points out that this is but the opinion of one administration and must be sustained by the Supreme Court before it shall be secure. But behind administrations and all courts stands a combination even greater than they—common sense and public opinion. And once the people of America become acquainted with the practiced purpose of the trade associations and see that their work is good, there will be no more thought of legislating them out of business than of suppressing universities and hospitals.

THERE are about twelve hundred trade associations in this country. Very few of them have got into trouble. Because most men are honest naturally most associations of men are honest. But the retribution which has been visited upon the few that have done wrong has been so conspicuous and so indefinite that fear has settled on the necks of all of them with paralyzing effect and a great injury to industry. Several organizations have been so perturbed that they have disbanded, so that doing nothing they might do nothing wrong.

Mr. Hoover suggests and Mr. Daugherty now agrees on eleven classes of useful work in which the trade association may properly engage. They are broad and ample, offering almost unlimited opportunity for service. Approval is given of uniform systems of cost accounting, though cost statistics may not be exchanged. But statistics on production, wages, capacity, sales, distribution and price may be collected, provided that they are compiled into classified totals and averages and delivered to the Secretary of Commerce for distribution through the press to industry and to the public.

IN other words, a man's own business is his own affair and he may keep it secret if he likes. But the public has an interest in the business of an industry. And if such an industry organization is dealing fairly with the public, it need not hide its figures or its work. And if it has no secrets, it need never be afraid. This is just sense.

Every trade association in the land should cheerfully and gratefully accept this offer and proceed to clear its statistics through the government. At last it can quit worrying and go openly to work on all these helpful things that can and should be done. The hobbles of fear are off.

Edward Marriott Hewlett

Pioneer and original investigator in the switchboard field, particularly in the matter of large oil circuit breakers.

PUBLIC conception of what an individual has done is frequently very misleading. It is not unusual for a man to be popularly known for an achievement which, after all, is only of a minor nature in comparison with his other work. The case of E. M. Hewlett, engineer of the switchboard department of the General Electric Company, is one in point. Mr. Hewlett has devoted almost his entire attention to the development of switchboards and switchboard devices, particularly circuit breakers. The work that he has done in the investigation of factors affecting the rupturing capacity of large oil circuit breakers will probably be of the most lasting importance to the industry. Lack of such information has for some time been a serious limiting factor on large power layouts. None the less, in the popular mind of the industry Mr. Hewlett is known as the originator of an insulator for line suspension. It must not be thought, however, that this work was unimportant. On the contrary, it made possible the development of high-voltage systems—100,000 volts and above—and thus added a great impetus to the building of high-tension lines.

It was in 1890 that Mr. Hewlett, then a young man of twenty-four, entered the electrical field. He had previously spent several years in Colorado as manager of the Cascade Town Improvement Company, where among a number of other things he made the preliminary layout for the building of the carriage road to the summit of Pike's Peak. He started his electrical career by taking the "expert course" of the old Thomson-Houston Company at Lynn, Mass. About a year later he went to the New York office, where he worked on a number of electrical displays which at the time attracted considerable public attention. At that time he received charge of improving the lighting of the Statue of Liberty, which resulted in the installation of the first focusing lamps in the torch and also of a row of lamps under the rim of the liberty cap. In this connection he was the first to try floodlighting the statue, but the generating capac'ty available was insufficient so for the time being the project was abandoned.

In 1893 the Thomson-Houston Company and the Edison General Electric Company combined to form the General Electric Company, and Mr. Hewlett returned to the Lynn factory as assistant to the department head on switchboard and controller work, doing development work on switchboards, magnetic blowout circuit breakers and other magnetic blowout devices. Later he developed insulators for third-rail railway work and for underground trolley rails running in slots which previously were required in connection with cable street-car systems. He also developed the underground "contact plow" which is still in use. Mr. Hewlett developed a type of oil circuit breaker with a high interrupting capacity for use in the main station of the Metropolitan Street Railway Company, New York. The success of this pioneer large-capacity installation gave an incentive to other companies. As power distribution developed and the voltage was increased step by step, it was necessary at each successive stage to study the possibilities of insulators, insulating materials and so forth for the bushings for oil switches and for supporting disconnecting switches, busbars, etc. During this period Mr. Hewlett developed switches and switching equipment to meet each new requirement.

Mr. Hewlett designed the control switchboards for the Panama Canal. This installation was particularly adapted to naval use and made possible the control of the machinery from a distant control point, something that had not heretofore been done. During the war he was chief consulting engineer of the naval experimental station at New London.

Mr. Hewlett was born Sept. 14, 1866, at Cold Spring, N. Y. He has spent his entire career in the electrical industry with the General Electric Company and its predecessor, the Thomson-Houston Company, and is one of the pioneers of the industry who are still vigorously engaged in constructive work.

Editorial Comment

Electrical World, February 25, 1922

Volume 79 Number 8

Muscle Shoals Not for Private Exploitation

THE idea back of the water-power act, which is discernible in almost every line and thrusts itself to the fore on every page, is that the water powers of the country shall be developed either by or for the people. To them is given the prior claim, and only under exceptional circumstances can private enterprises obtain leases. That the Ford offer for Muscle Shoals was ever considered at all was due to the paramount national interest in munitions and fertilizer and to nothing else, and now that Mr. Ford's real reason has been revealed interest in his bid for Muscle Shoals wanes. His purpose is not to make fertilizer; this is only a hope. What he seeks at the expense of the public is cheap power to make automobiles and automobile parts.

This much has been established in hearings before Congressional committees. We have commented before on the ridiculously low price offered by Mr. Ford for the property of Muscle Shoals, and time has unfolded what the formal proposal hides. The Alabama Power Company last week offered to pay as much for the steam plant and uncompleted water-power project alone as Mr. Ford bid for the entire property, and we doubt whether Congress will long debate which of the two to choose. An electric public utility is engaged in public service. Every cent it earns and every cent it spends is subject to the scrutiny of a public service commission. Such a utility is bound to supply every one, without discrimination in either rates or service, and its interests are those of the public. It excels government ownership and operation in that, although publicly regulated, it retains all of the initiative and skill of private enterprise. The Alabama Power Company's system is interconnected with the other great power networks in the Southeast. It is therefore in a position to develop Muscle Shoals to a maximum and to spread the advantage not only throughout Alabama, but through Tennessee, Georgia, South Carolina and North Carolina as well. Mr. Ford represents only himself. The Alabama Power Company represents the power users of the entire South, or, generally speaking, the public itself.

A Clearing House for Meeting Dates Is Needed

DURING this coming week the jobbers are holding meetings in Chicago on Monday and Tuesday. There are jobbers' meetings in New York on Tuesday. There are meetings of the jobbers' association executive committee in Atlantic City on Wednesday and Thursday. On the same days there are also in New York meetings of the N.E.L.A. Commercial Section wiring committee, Merchandising Bureau, Lighting Sales Bureau, Power Sales Bureau and the joint committee on the "better business" campaign. These are different organizations with practically no overlapping membership, but they are of particular interest and concern to many others within the industry who are often desirous of attending both jobber and central-station meetings or at least of getting contact with the out-of-town electrical men who may be attending them. And this conflict of dates makes it impossible.

It has often been suggested that some checking authority be set up to pass on the dating of all meetings of electrical men, so that they may be more sensibly distributed around the calendar and men who have good reasons for wanting to attend more than one class of meetings may not be prevented by their inability to spend the same day in two cities. One of the things that the electrical industry suffers from is the lack of contact which exists between the different classes of electrical men. Central-station men and contractors should therefore be encouraged in every possible way to attend meetings of manufacturers and jobbers and to contribute their thinking. Manufacturers, jobbers and contractors should be urged to sit in on central-station meetings. Jobbers and manufacturers should deliberate more together. For the greater the interchange of ideas, the clearer will become the common purpose and the better the results for the whole industry.

It will be helped by more careful scheduling of meetings so that conflict of dates may be avoided. We suggest that the Society for Electrical Development be established as the clearing house for meetings and that hereafter all meeting dates arranged for committees and for conventions be considered tentative until submitted to the society for a report as to what conflicting meetings have been already recorded.

The Lesson of the Indianapolis Mob Scene

PUBLIC utility men should not pass over the story of the remarkable mob-demonstration in Indianapolis the other day without a little thinking on the actual significance of this unprecedented affair. Led by the Mayor of the city—a sensationalist—several thousand people gathered in response to placards which the Mayor had posted about the town and marched to the State House as a protest against a decision of the Indiana Public Utilities Commission. They were deluded, undoubtedly. They were misinformed and misled by the Mayor. But they were interested. They had been told that their rights had been violated by the granting of higher rates and the authorization of a merger. They recognized their concern in such a matter and turned out at the Mayor's call—five or six thousand strong—and followed him to the Capitol, led by a band of music. There was no hysteria, no mob fury. The Mayor made a speech of denunciation from the State House. Then they all went home.

The point is this: More than five thousand people

in Indianapolis gave this undeniable evidence of their interest in utility rates and mergers. They made a protest because they were misinformed. They would have been satisfied and have made no protest if the facts had been given to them as thoroughly as the fabrication was. But the true story of this act of the utility commission performed in their behalf, the real reasons why these things were done—which they would have been glad to know about—were never carried to them. Therefore, the Mayor's version, which they were not glad to hear, aroused them to the expression of resentment.

Perhaps some day public service corporations and utility commissions will learn that it is not enough to issue terse, formal statements and hand down decisions in semi-technical or semi-legal language and leave the public to find out what it is all about. The story of what has been done *for* the public can be made even more interesting than any agitator's tale of what he claims has been perpetrated against it. But nobody seems to care enough to take the trouble to present the welcome and encouraging details. Therefore the people hear and know practically nothing of this interesting concern of theirs until some trouble maker comes along with facts that are all wrong. The Indianapolis mob scene should bring this home to every one of us.

Electric Ovens Challenge Fuel-Fired Type

LITTLE less than inspiring are the recent service records of electric ovens under stress of depressed industrial conditions. When applied by engineering skill to cut down the losses in material undergoing heat treatment, to improve the quality of the product or to reduce the hours or minutes of processing, this class of equipment makes history.

This branch of the art is still young, and every year sees real progress toward broader and deeper service values. Better control of performance in ovens designed for baking water japan represents one of the important developments of the year just passed. The explosion problem no longer looks formidable with the improved ventilation now attainable. In the manufacture of shoe eyelets, camera parts, automobile starting and lighting equipment, cutlery, glass and other products, notable gains in time, quality, convenience and hygiene are being realized. When some operations can, by using electric ovens, be cut in time to from 2 to 10 per cent of the older requirements and with actual improvement in finished material, the challenge of this type of industrial heating is well-nigh unanswerable.

One word of caution is necessary in the rapid advance of this absorbing specialty. The closest co-operation should be maintained between the user, the central-station engineer and the oven manufacturer in fitting equipment to specific commercial services. Upon the mechanical arrangement, housing and form of electric heating apparatus often depends its application efficiency. "Catalog engineering" is ultra-risky here, not perhaps in the way of total failure, but along the line of falling far short of the expected results. In new applications, even of well-standardized equipment like the so-called space-heater units, through preliminary experimentation under skilled eyes pays rich returns on the time and cost necessary to indicate the best practice. American manufacturers are sometimes accused of letting the attractions of "mass production" overbalance technical skill in the turning out of delicate and expensive products. Whether these strictures are justified or not, the carefully applied electric oven is becoming more and more a tool of precision through which uniformity of quality may be still more nearly perfected, and thus literally it is indispensable to its user.

The California Commission Has a Backbone

IN THE first days of the California Railroad Commission Theodore Roosevelt said to the late John M. Eshelman: "Your first task will be easy. Elected as you will be under a movement responsive to the people and independent of the corporations, you will find it easy to reduce rates where they are too high, and you will find many rates too high. Your real task will come later when you have to do justice to the corporations and raise rates in spite of the popular clamor to lower them. The test of public regulation will be the ability of public men to do that and to maintain popular confidence in doing it." The California Railroad Commission has just had such a test, and it has shown the public that it stands for established principles of sound regulation without fear of political death or desire for preferment. The attack was made by Governor Stephens, who criticised the commission for its action in increasing the rates of two utilities in southern California. Although, in view of the forthcoming state elections, the Governor's action might well have been construed to be purely a political one and for this reason passed by with only a perfunctory reply, the commission has chosen to make it clear in vigorous fashion that it will show no favoritism.

During the ten years' life of the California Railroad Commission the utilities of the state have shown a growth surpassing on a basis of population that of the utilities in any other section of the country. The power companies have expanded and covered the state until no section of importance is without an adequate supply of electric service. The use of electricity has become second nature both to the industries and the homes of the commonwealth. The rates for service are fair to the consumers and are cheaper than the cost of competing energy. But the end is far from being in sight. Tremendous programs of expansion have been announced. This year it is planned to expend more than $50,000,000 in the extension of the stations and distribution systems of the power companies. The apparatus to utilize this energy will bring the total expenditure in the state during the year for electrical material and labor for its installation to the astounding total of nearly $190,000,000. The veriest tyro should appreciate that an industry of such a size and of such importance to the state must have the protection of the law and the confidence that it deserves.

Inasmuch as the California Railroad Commission holds in its hands the power to assist or materially to retard the growth of these companies, the commission should share with the utilities in public good will and support. But public confidence and understanding concerning the actions of the regulatory bodies and the policies of the utilities are things of slow and tender growth. In time the people's viewpoint will accord with the facts, but today confidence is easily turned into distrust, and both utility commissions and public service companies must keep the records clean and stand up stiffly for the right.

Safety Engineering Should Begin at the Drafting Board

THERE can be little doubt that foresight is absolutely fundamental to successful safety engineering, and yet between the recognition of this truth and preventive activities a very wide gap often exists. It is justly a source of pride that electrical engineers and inventors have paid so much attention to safety problems from the early days of the industry. Modern apparatus, and even the older machines, have a remarkable record of safe operation in innumerable plants, and the advance of the art of distribution has been accompanied by sustained interest in safeguarding the performance of equipment. There is still room, however, for more thorough preliminary consideration of safety problems, both in designing apparatus units and in laving out structures to house or serve them. Questions of illumination, spacing, shielding, reduction of projections and obstructions in forming frames, improving accessibility of emergency switches—these and other matters associated with the fullest and safest use of plant equipment in its broadest meaning deserve the consideration of the designing and operating engineer alike. Some regular provision for special scrutiny of machinery designs and plant layouts along safety lines should certainly form a part of well-rounded electrical engineering creative work, for out of minor defects in layout may arise major troubles.

Adaptation of Furnaces to Lower-Grade Fuels Should Be Studied

ALTHOUGH most operating companies are now able to obtain all the fuel they require in the grades they desire, it was not long ago when many of these same companies had to be satisfied with anything they could get. If similar conditions are forced upon the companies again, or if it is found more economical to burn lower-grade fuels than are now being used, it should be a source of encouragement to know that even hogged wood is being burned successfully and economically in the Northwest as a central-station fuel. Furthermore, this accomplishment should be an inspiration to the study of the furnace adaptations necessary to burn other fuels which are abundant in different parts of the country. The method of burning hogged wood as well as the results obtained should be of interest to engineers, even if they never contemplate use of this particular fuel, as showing how resourcefulness can lift an engineer out of a predicament.

As pointed out elsewhere in this issue by H. S. Bastian of the Portland Railway, Light & Power Company, hogged fuel has two peculiarities that required no little study before they were mastered—it feeds badly from conveyors and, falling into piles, it burns on the surface so that it requires air from above to aid combustion. Like other combustibles rich in volatile constituents, it needs large furnace space. The form finally adopted in the case considered was the Dutch oven with a curtain arch over the bridge wall. The arch was of particular service in holding the gases in the hottest part of the combustion chamber and thus speeding their ignition. It also steered the flames from the front of the fuel piles down over the rear so that the area of active combustion is the surface of the conical piles and not the area of the grate.

After the necessary changes were made in the furnace, a thorough test showed that the water-tube boiler could be pressed to 350 per cent of its rating and brought to an over-all efficiency of nearly 63 per cent using fresh hogged fuel.

The experiment thus brought to a successful conclusion not only effected a considerable saving in the fuel costs of this particular company, but it is of general value in showing what may be done by the careful study of methods of combustion in utilizing almost anything that can be made to burn. Sawmill waste, like bagasse, is a fuel available only in special places, while poor coal and lignite are to be had over great areas. By proper precautions they too can be put to excellent use.

Opinion of Lightning Arresters Clearly Defined

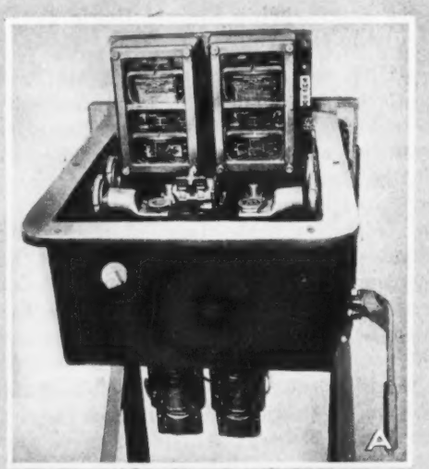
PRESENT opinion as to the value of lightning arresters for high-voltage lines was clearly revealed at the midwinter convention of the American Institute of Electrical Engineers. Replies to a questionnaire of the protective devices committee indicated a general belief in the superior value of the aluminum and oxide-film arresters, but also an appreciable definite opinion in favor of low-discharge-rate spark-type arresters. The latter were sharply opposed in the paper by E. E. F. Creighton setting forth the importance of the high discharge rate of the valve-type arrester, and this position was generally supported in the discussion.

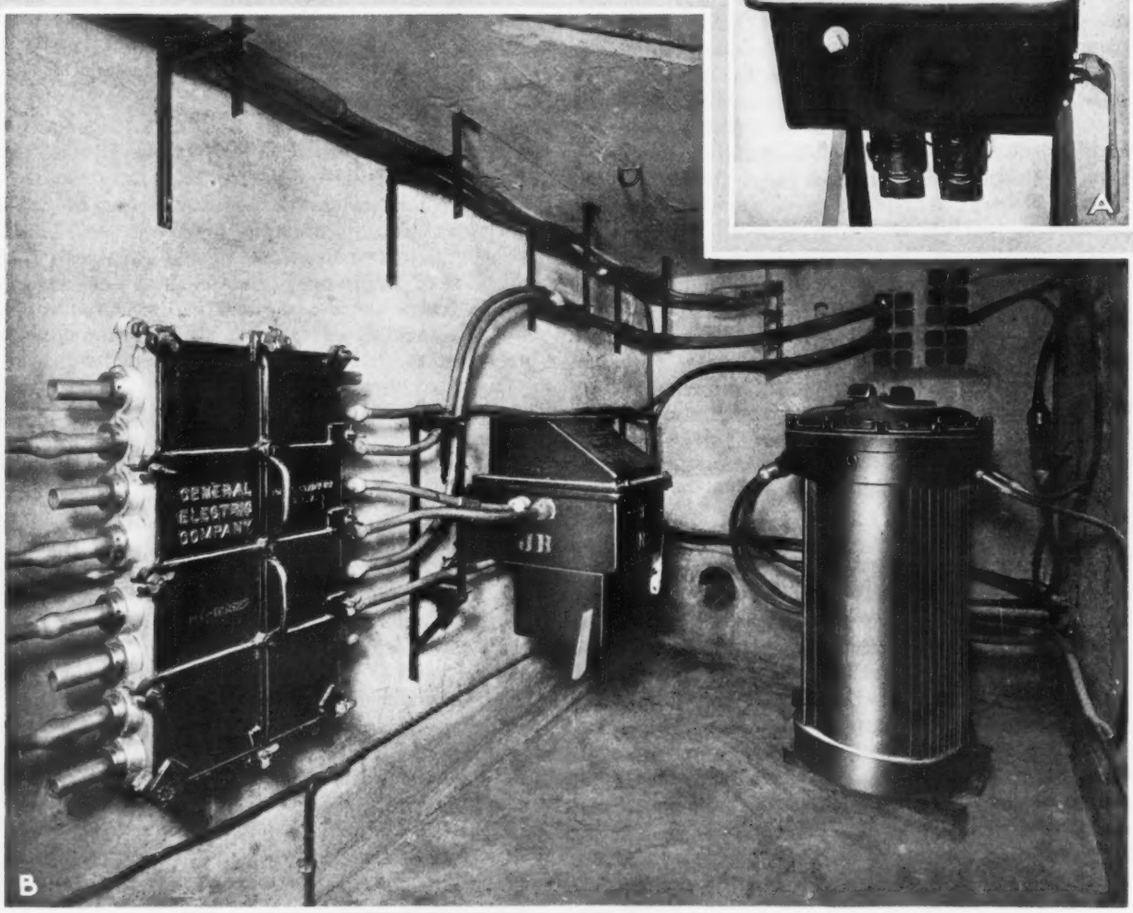
It appears probable that present doubts as to the value of the valve-type arrester lie rather in the question of its reliability than in that of its principle of operation. It deteriorates in several ways, and expert care is necessary for continuity of function. This difficulty has been and is under experimental study, and simpler tests and less care for proper condition are already announced. Particular interest attaches to the announcement, in the discussion, of a new type of valve arrester which involves the use of neither liquid electrolyte nor chemical change, the causes of most of the troubles of the present valve-type arresters. The new principle is an ingenious combination of high-resistance metal disks utilizing the electric properties of very thin air films. Commercial appearance is promised shortly.

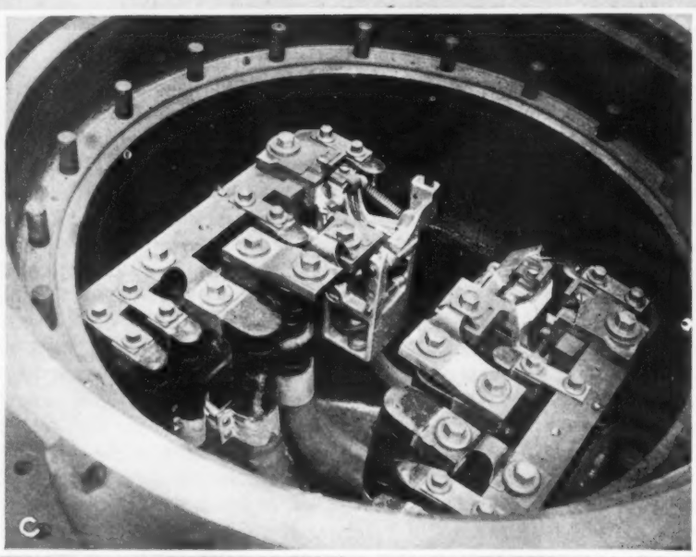
Progress to date is clearly shown in the agreement as to the approximate values of voltage and traveling charge associated with lightning disturbances and as to the fact that the line insulators themselves are an important factor in relieving them. This suggests the fundamental, though necessary, fault in present lightning-arrester practice, that most lightning disturbances must pass over a long length of line before reaching the arrester designed to relieve them. Ideal protection would be offered if every insulator were an arrester, so that wherever a disturbance appeared relief would begin at once. The thought may be extended still further to the suggestion that each foot of line be its own arrester by allowing it to discharge into the air by means of corona whenever the voltage rises appreciably above normal. This form of protection has been seriously proposed abroad, but American engineers have apparently given it little attention.

Further research in the lightning-arrester field will probably give first attention to the improvement of the valve type. In view of present definite knowledge of the quantities involved, it would also appear a relatively simple matter to determine whether the corona discharge would be helpful. The principle is ideal; the only question is as to its quantitative value.

Underground Networks Being Equipped with Manhole Circuit Breakers







MUCH has been done during the last few years to isolate system disturbances, the most recent step taken being to use manhole-type circuit breakers and selective protection within the distribution network itself. As economical and reliable devices are developed it may be expected that sectionalizing apparatus will be applied to overhead networks as well. Two recent examples of underground installations are shown. *B* is a typical transformer vault in the underground system of the Puget Sound Power & Light Company containing a manhole circuit breaker *(A)* with selective protection. *C* is a manhole-type sectionalizing switch in the direct-current network of the New York Edison Company.

Prices, Turnover and Expansion

Three Aspects of the Business Problem of the Central-Station Manager Which Are Fundamental to Success Yet Little Thought of by the Other Business Men

By W. W. FREEMAN
President Union Gas & Electric Company, Cincinnati

THE basis of practically all troubles between the public and the public utilities is misunderstanding. Because the power house, the transmission lines and the meters in their cellars are all mysteries to the people, they are naturally uninterested, unsympathetic and suspicious. They fail to realize that fundamentally the utility is just a business of manufacturing, distributing and selling a product that is no more cryptic in character than many chemical commodities, for instance. It is extremely desirable, therefore, that the business side of the central station should be explained and made clear and the reasons why a utility must be a monopoly and must have more and new capital continually should be presented in such form that soon all men will understand. The exposition of three aspects of the central-station business problem which Mr. Freeman makes in this article is the kind of a human-interest story that can profitably be carried to the public, for it is just the kind of information that pictures the human side of the utility in a way that appeals to other business men.

THERE is an interesting comparison—or, rather, three interesting comparisons—between the business aspect of a central-station company and the business or financial problem of an ordinary commercial enterprise. It is important, it is vital in the operation of a utility, yet it is seldom heard discussed in meetings of electrical men and therefore has never been considered by the general public. Nevertheless, I believe that were this interesting parallel to be pictured clearly to the people so that it became a matter of common understanding, it would exert a very profound influence upon the attitude of the public toward the utility.

The central-station company is fundamentally a business enterprise because of the very fact that it is financed by people who have invested their savings in its capitalization for profit. It is only because this business corporation is engaged in the manufacture, distribution and sale of an essential public service that the element of public regulation has been introduced and the control of this business has been taken in part out of the hands of the men to whom the investors have given their authority to operate the entire enterprise. But by the exercise of that very control the business of the central station is deeply affected, so that it becomes a problem very different from that encountered by the business man in other lines, and in ways which would seem extremely hazardous, if not fatal, to many a manufacturer of insulators or soap or woolen fabrics.

Price Fixed by Buyer

In the first place, the utility business is probably the only business where the price is fixed, not by the seller, but by the purchaser. This may not be literal or technically accurate, but in so far as the principle is involved it is true. The rate is fixed by the utility commission in the interest of the consuming public, and this is proper. But the effect upon the central-station company is to prevent this commercial enterprise, this business, from adapting and adjusting its prices to the market and the times as other kinds of business do as a matter of course. It establishes a price fixed for a long period, inflexible and unable to meet abnormal needs or opportunities. And this works to the disadvantage both of the utility and the public, as was seen during the war period, when expenses soared above all precedent and it cost more to provide the service than the rate produced.

When this is clearly understood by the people, there will evolve, I believe, some form of controlled rate that can be automatically adjusted to meet abnormal economic conditions as they may arise, by giving the utility commission continuing jurisdiction enabling them to act promptly as the need arises, in the interest both of the utility and the people. The result would be that relief could be given at the time of stress and readjustment made apace with a restoration of the former status, instead of its being necessary for the utility to suffer by compulsion until a critical condition compels attention, after which the public will naturally expect a corresponding reduction of the rates as soon as the emergency has passed, forgetting that rates cannot come down any more quickly than they went up, if a balance is to be struck.

Slow Turnover

The second comparison lies in the matter of turnover, the length of time required to reproduce in cash the equivalent of the amount invested in the conduct of the business. The baker sells out his stock each day. He has practically a daily turnover, and the percentage of profit which he makes each day multiplied by three hundred days in a year is the approximate rate of his earnings. The ordinary larger business enterprise expects to turn over its capital three, six or twelve times a year. The department store turns its money over four times, and if it realizes 5 per cent on each turnover it shows an annual earning of 20 per cent on its capital. But the central station turns its money once in each five years, if it is fortunate, and a 20 per cent gross earning is most successful. The public service corporation, therefore, that might earn 50 or 100 per cent gross on its business done would still receive a lower return on its invested capital than other manufacturers and business men expect to make.

The public utility needs from four to fifty times as much capital invested as is required for other purely commercial industries. This money must be tied up in stations, generating equipment, transmission lines and all the other contingent expenses of the service. Each kilowatt of energy can be produced only through the functioning of this combined investment, and instead of making bread, delivering it and getting its money back

as the baker does, the utility must permanently entomb its capital in physical property from which develops the service which it sells. This clear picture of the profit-production process of the central station has not been carried frankly to the people, but some day will be understood and bring with it a clearer popular conception of what the utility should be required to earn.

The third comparison is no less striking. In every commercial enterprise provision must be made for financing new capital requirements and providing for enlargements and extensions of the business. The ordinary method of other manufacturers and merchants is to set aside a surplus out of their profits as a building fund. A bank that has a capital of from one to twenty-five millions will usually have on its books an accumulated surplus of from five to twenty-five millions. Other businesses provide other amounts, but it is standard practice, required by the common conception of "good business." But the utility company is compelled to go to the public each year for the new capital it needs.

The laws under which the utility commissions operate specify that a "reasonable rate" should be charged for a public service, and "reasonable rate" is construed to mean the sum needed for operating expenses and a fair return of profit. But no provision is made for building up a reserve out of accumulated profits with which to grow. As the business expands and new lines and new stations are required, fresh capital must be obtained from the public. The total that must be sought, for instance, to meet the present situation, where throughout the entire country central stations are operating close to capacity with the approaching prospect of an increasing industrial market making a demand upon them for a steadily increasing power supply, bulks into a sum that is enormous. It is estimated that the capital that will be required to finance new capital expenditures for public utilities within the next four years will necessitate the provision of the equivalent of $125,000 each and every hour of that period.

A DIFFICULT SITUATION

This produces a situation of extreme difficulty for the utility executive that reacts greatly to the disadvantage of the public. If an ordinary manufacturing concern chooses to expand its business by increasing its plant or output or extending its selling activities, that is a matter of its own concern. The public has no voice in it and the business man goes ahead in accordance with his own wishes. The utility has but one possible purpose in expanding its property, and that is to meet the demands of the public for service. It is not the desire of the company that prompts new capital expenditure, but the actual demands of the public for a service which they can get in no other way. And therefore the utility is justified in going before the public freely, frankly and without hesitation or reluctance when new money is needed, to meet the public openly and ask for what is needed under the restrictions which the public itself has established.

The public regulates and restricts the utility in the operation of its business, but it leaves entirely in our hands the solution of the problem of raising the money needed to do the job, which it wants done in its way. There is no reason, therefore, why we should not in so far as possible share the problem openly with the public by informing them as to the conditions and gradually developing a more active co-operation in the processes of financing.

There is a cheerful and a satisfying side to it as well as a perplexing one, however. Under the growing influence of the popular appreciation that public utilities are regulated and guarded by the state, the reputation of public utility securities has gradually been enhanced until they stand today as one of the best obtainable investments. The banker buys them for resale, but he has changed from the earlier attitude in which he felt it necessary to coerce the utility in his endeavor to meet the needs of his customers.

Out of this increasing interest in utility securities has come the new practice of selling direct to the customer, of taking him into partnership as an owner of the business, whereupon we have a new psychological effect. The public service company is no longer his enemy whom he should resist, but his good property and friend whom he should defend and protect. Pride in his investment grows into an active interest in the company and a concern for its ability to pay a profit. I have one case in mind that illustrates it well, wherein a man who in times past had been a most determined opponent of the utility came to a public meeting and supported it. It was soon found that his son had become a stockholder and the father's view had changed.

WHY A MONOPOLY

The central-station company must be a monopoly for the simple reason that it requires so much money to capitalize it that duplication would be folly. There is but one way in which a utility can be duplicated and operated in defiance of economic laws, and that is by the municipal ownership of the competing company. But it is being proved that municipal ownership is political ownership. True public ownership can only be obtained by the natural process of the purchase of an interest in the utility itself by the people as individuals. Already 1,600,000 people own public utility securities in the United States, plus all those others who are potentially stockholders through their interest in banks, insurance companies and other corporations that have invested in them. As a matter of fact, the proportion of the people who are not already directly or indirectly interested in the public utilities is exceedingly small.

It remains for us, in the utility business, to make this clear to them and to show them wherein their interest and our own are one. When all this is understood by the public the hurtful restrictive influence of regulation will be relieved, because the people will wish this business of theirs to prosper to the fullest degree and make possible a service that is unhampered.

New Italian Hydro-Electric Plant to Yield 16,000,000 Kw.-Hr. a Year

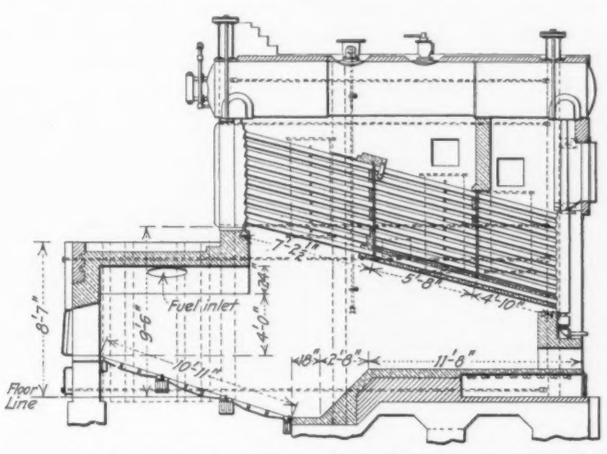
A HYDRO-ELECTRIC plant with a power yield of 16,000,000 kw.-hr. per annum is nearing completion at Piana dei Greci, 20 miles south of Palermo, Italy. A report made to the electrical equipment division of the Department of Commerce gives the details of the plant's construction. Some of this information is as follows: The dam is 110 ft. high and 980 ft. long. It provides nearly 20,000,000 cu.yd. of storage. The water has a drop of 1,550 ft., driving three groups of turbines and alternators rated at 3,500 kw. each. The project also permits of some use of water for irrigation in the Palermo Valley. The power line to Palermo is being strung on two different metallic posts, each carrying two sets of 100-mm. copper wires.

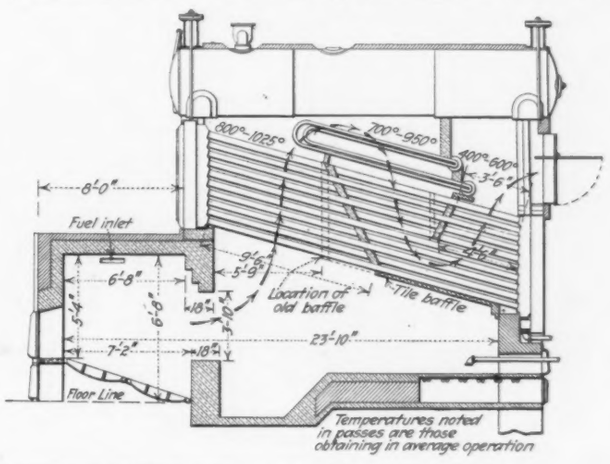
Generating Power from Waste

"Hogged Fuel," or Sawmill Refuse, Proves to Be a Valuable Combustible in Lumber Producing Regions—Care Must, However, Be Exercised in Firing if Best Results Are to Be Obtained

By H. S. BASTIAN
Assistant Construction Engineer Portland Railway, Light & Power Company

WHEN the Portland Railway, Light & Power Company decided, early in 1920, thoroughly to investigate the use of "hogged fuel," or sawmill waste, not only were the actual theoretical and practical heating values of this combustible studied but also its action in the furnace, in order that the furnace after it had been rearranged might utilize to the highest degree possible the potential heat energy contained in the fuel. Numerous types of hogged-fuel furnaces were in existence, but in order to meet the conditions imposed by limited space and a boiler plant in active operation and to reduce changes to a minimum the fundamental characteristics of this particular fuel were studied.





FIGS. 1 AND 2—ORIGINAL ARRANGEMENT OF FURNACE FOR BURNING HOGGED FUEL, AND MODIFIED ARRANGEMENT WHICH NEARLY DOUBLED EFFICIENCY

The boilers selected for the tests were 440-hp. Babcock & Wilcox water-tube boilers, served with Dutch ovens. The fuel is fed through two holes in the top of the arch directly over the grates by means of conveyors and chutes, forming cones of fuel on the grates.

At the best, the conditions surrounding the use of hogged fuel are far from desirable as it carries water to the extent of about one-half its weight and its bulk is three or four times an equivalent weight of coal and nine times that of an amount of coal of equivalent available heating value. This makes special handling and storing facilities imperative. Mechanical difficulties of handling are also encountered, as this material will not flow freely through a chute or out of a hopper. The fuel is measured in "units," a unit being 200 cu.ft. (5.6 cu.m.), generally measured as it falls from a conveyor, without being packed.

Characteristics of Hogged Fuel

Instead of burning, as do coal and coke, with a glowing bed, hogged fuel burns almost entirely from the surface. Disturb the pile or turn the surface under, and the fire might be extinguished. More than that, this fuel cannot be treated as a solid but only as a gas, as it sometimes has a ratio of volatiles to fixed carbon of five to one and this ratio averages well over three to one in the fuel as fired. These volatiles start to pass off at a temperature below the boiling point of the water in the fuel. Thus it is necessary to catch and consume the gas, which represents fully two-thirds of the total heat in the fuel. In this respect the combustion of hogged fuel is something like that of lignite.

The Dutch oven type of furnace offers the most promising means of successfully burning sawmill refuse as it is one of the best types of furnace for gaseous fuels. The importance of treating hogged fuel as a gas can be appreciated by reference to the typical analysis printed here and to the accompanying curves. In addition, the percentage of ash is small, making this fuel radically different from other solid fuels.

Consideration of these characteristics will account for the action of the Dutch oven furnace as finally adopted by the Portland company. The style of furnace adopted for use with the particular style of boilers involved was best adapted to the peculiar nature of the fuel. This arrangement fulfilled the requirements that any required changes should be kept at a minimum. The last row of grate bars was removed and a 3-ft. (0.9-m.) bridge wall built. A 22-in. (56-cm.) hanging-curtain arch was inserted directly over the bridge wall. Fourteen boiler tests and forty-three fuel analyses have been made and were reported on page 215 of the 1921 report

TYPICAL CHARACTERISTICS OF FRESH HOGGED FUEL

Material	Douglas Fir	Ash (per cent)	0.7
Moisture (per cent)	47.9	B.t.u. per lb. dry	8,970
Volatile combustible (per cent)	39.7	B.t.u. per lb. available, as fired	4,050
Fixed carbon (per cent)	11.7	Pounds per unit (200 cu.-ft.)	3,900

of the prime movers committee of the National Electric Light Association.

The first boiler tests made with the unaltered furnace resulted as shown in column 1 of the accompanying table. The latest test (column 2) of the type of furnace finally adopted with superheaters added to the boilers shows by comparison the improvements that have been effected and also indicates what operating results can be obtained from the use of this waste fuel. During a later test one boiler was held at 305 per cent rating for six hours, with an hourly peak rating of 350 per cent, using fresh hogged fuel. With stored fuel a rating in excess of 250 per cent was obtained.

REQUIREMENTS FOR HIGH EFFICIENCY

In order to get the most efficient results with the least amount of excess air, the volatile gases must be thoroughly mixed with air and burned before coming in contact with the cool boiler tubes. The curtain arch

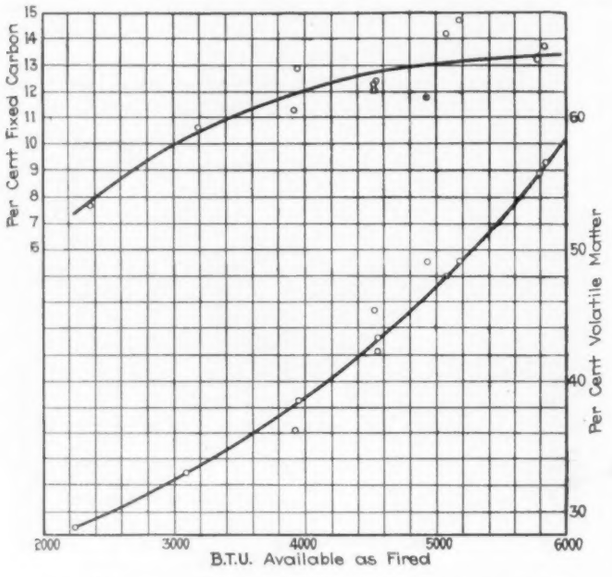


FIG. 3—RELATION OF FIXED CARBON AND VOLATILES IN HOGGED FUEL TO B.T.U.

aids this by retaining and mixing the gases in the hottest part of the combustion chamber. The removal of the last row of grate bars kept the fuel under the Dutch oven arch, where all the distilled gases were forced to mix with air in the hot zone of the furnace. The time available for making this mixture of air and gas is very small, and the arch virtually lengthened the time in which combustion could take place by increasing the speed of ignition.

The air for combustion should be applied at the point where the combustion occurs, which in the case of hogged fuel burning in deep cones is at the surface of the pile. Since a large portion of the combustible is already in suspension in the furnace in the form of gas, a counter-current of air serves to mix the combustible and the oxygen in a highly effective manner. In this combustion the heated furnace walls play a very important part. The air coming up through the fuel pile and the grates is moving in the same direction as the gaseous portion of the fuel, and traveling more slowly, owing to the resistance of the fuel bed. This "stern chase" does not result in the most efficient furnace action.

By bringing part of the air directly in contact with the surface of the fuel the escaping gases have an opportunity to unite with oxygen at once and form a blanket of flame through which the remainder of the combustible gas must pass. The air is readily supplied by opening the doors in front of the furnace over the fire, a method of procedure generally adopted to check the action of a coal fire. In this case, however, combustion is quite noticeably aided. If the doors are opened to such an extent that a light haze just appears at the stack, the furnaces will carry their heaviest load with a resulting flue-gas analysis, as noted in the accompanying test data. Should the fire doors be closed, a thick black smoke, resembling the smoke from a badly controlled oil fire, appears.

HOW HOGGED FUEL BURNS

The importance of keeping all the surface of the fuel covered with flame should be thoroughly appreciated. Hogged fuel does not lie quietly on the grates until consumed, as do most fuels. Nearly 75 per cent of the fuel is burned in suspension in the form of gas. Hence an unburned spot on the surface of the fire has the same effect as a missing grate bar in a coal-fired furnace. Before the curtain arch was installed in these furnaces the rear surface of the fuel merely smoldered and threw off pale blue flames. The hanging arch was so placed that the flames from the front of the furnace were guided down over the rear surface of the cones of fuel, with the result that, despite the fact that the grate area was reduced by one-third, the combustion area, and consequently the boiler capacity, was practically doubled. A secondary combustion chamber would remedy the deficiency caused by an inactive fuel surface, but in this case the endeavor was made to obtain the entire action under the oven arch.

COMPARATIVE TESTS OF FURNACES USING HOGGED FUEL

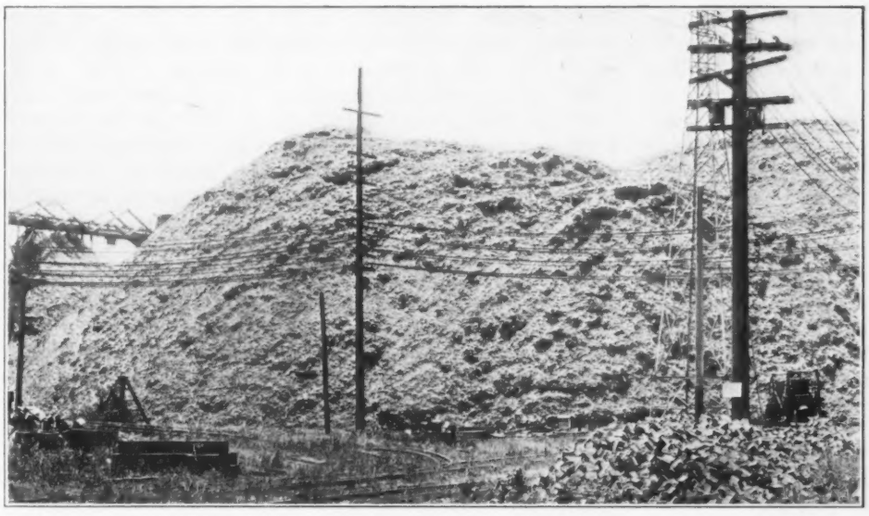
	Original Furnace	Rebuilt Furnace
Duration of test (hours)	10	15
Make of boiler	B. & W.	B. & W.
Grate surface (sq. ft.)	121.8	87.2
Heating surface, boiler (sq. ft.)	4,399	4,399
Heating surface, superheater (sq. ft.)	....	855.5
Steam pressure (lb. gage)	171	177
Temperature of steam (deg. Fahr.)	372	557
Temperature of water entering boiler (deg. Fahr.)	84.4	94
Temperature of escaping gases (deg. Fahr.)	610	505
Percentage of moisture in fuel as fired	50.1	44.8
Factor of evaporation	1.17	1.27
Equivalent evaporation per square foot of water heating surface per hour (lb.)	3.96	8.45
Equivalent evaporation per hour (lb.)	17,435	37,172
Boiler horsepower developed	505	1,078
Percentage of rated capacity developed	114	246
Water fed per pound of fuel as fired (lb.)	1.58	2.5
Equivalent evaporation per pound of dry fuel (lb.)	3.63	5.74
Calorific value of 1 lb. of dry fuel (B.t.u.)	9,170	8,850
Efficiency of boiler, furnace and grate, based on dry fuel (per cent)	38.4	62.95
Efficiency, based on fuel as fired (per cent)	44.8	71.1
Analysis of flue gases by volume (per cent):		
Carbon dioxide	12.4	16.2
Oxygen	4.8	3.4
Carbon monoxide	0.57	0.05
Nitrogen, by difference	82.23	80.35

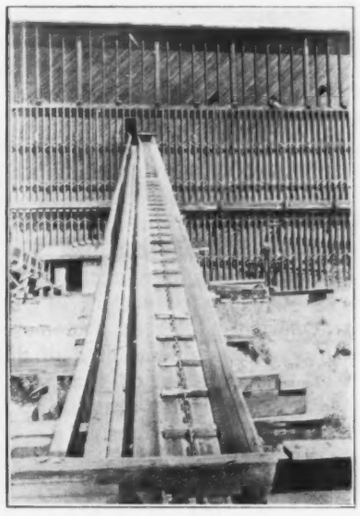
A peculiar condition existing in the combustion of hogged fuel lies in the fact that the percentage of CO_2 in the flue gas may not always be a true criterion of the efficiency of combustion. The wood, in breaking down into methane and other combustible gases, sometimes leaves as a residue the stable CO_2 compound, which is not formed as a direct product of combustion. This, however, is not very easy to establish definitely. If no CO and but little free oxygen is detected, the combustion may be considered of good quality.

The boiler plant in which these investigations were conducted is made up of eight 440-hp. Babcock & Wilcox

horizontal water-tube boilers and one 500-hp. Stirling boiler. Six of the horizontal boilers and the Stirling boiler are equipped with superheaters. The plant generates 18,000 lb. to 25,000 lb. (8,000 kg. to 9,000 kg.) of steam per hour for heating and other work and in addition runs one 12,500-kw. turbine at an over-all water rate of 14 lb. (6.3 kg.) per kilowatt-hour at full load and 3,000 kw. to 4,000 kw. on other units at an over-all water rate of 22 lb. (9.9 kg.) per kilowatt-hour. Thus the boiler plant using the fuel can operate almost continuously at 250 per cent rating and better. Individual boilers frequently exceed 300 per cent rating for considerable periods when fuel conditions are good. Indicating flow meters on each boiler make continuous observation easy.

The best method of controlling fires in this plant was found to be with a supervising fireman on the floor whose duty is to keep close watch on the condition of the fires. When any furnace is found to be too full or not full enough, a signal to the man on the firing deck on top of the Dutch oven indicates to him how to regulate the feed to the furnace in question.





FIGS. 4 AND 5—55,000 TONS OF HOGGED FUEL STORED FOR USE IN SUMMER, AND CONVEYOR, DRIVEN BY 50-HP. MOTOR, FOR HANDLING FUEL FROM DOCK TO STOCK HOUSE

STORAGE OF FUEL

The plants using this fuel run as stand-by plants during the winter and as base-load plants during the summer low-water period. It happens, as a natural result, that the particular sawmills which supply the plants in question produce more waste fuel than is needed in winter, and in summer the demand exceeds the supply. Therefore, it is necessary to store the surplus fuel during the periods of abundance. These storage piles sometimes assume quite generous proportions. One of several piles alone covers a ground space 400 ft. x 500 ft. (120 m. x 150 m.), is 90 ft. (27 m.) high, and contains 55,000 tons of fuel. It would supply the station on whose grounds it is stored with sufficient fuel for six weeks' full-load operation. It is deposited on the pile and reclaimed by means of huge drags, like hay rakes, attached to steel cables and hauled to and fro over the pile by 75-hp. logging engines.

It is not advisable to keep this fuel in storage in the open for more than a few months at a time, and then only through the dry summer season. The fire hazard from a heap of this material is not great, and ordinary precautions, such as are taken in any well-equipped industrial storage yard, are sufficient. The experience of this company has shown that when properly stored no spontaneous combustion can occur. The fuel when heaped up moist will generate heat, but this action takes place in the interior of the pile, where all air is excluded. The heat has never been found to rise above 145 deg. Fahr. in the pile.

SPONTANEOUS COMBUSTION NOT LIABLE TO OCCUR

In raking the fuel from storage, the compact, heated interior of the pile exhibits a phenomenon which shows that unless the fuel is brought in contact with the air in small quantities, spontaneous combustion might in rare cases take place. The instant that a mass of fuel brought out from the interior is allowed to fall apart in contact with the air, a sudden rise of 10 deg. to 15 deg. Fahr. in temperature takes place. This sudden heating is but momentary. Should a very large mass of fuel be suddenly mixed with air, the heat generated might approach the ignition point. However, this chance is quite remote and has never been approached closely in practice.

The chief objection to storing this fuel is its deterioration with age. Fresh hogged fuel, especially when moist, will set up a slow oxidation when piled up and left undisturbed and in time will be reduced to a fine hard substance of practically no value as a fuel. To reach this state, however, it is necessary for the fuel to remain in storage a year or more. The result of eight months' storage may be seen by comparing the analysis of fuel stored for this length of time with the analysis for fresh hogged fuel:

	Relation to Condition when Fresh
Moisture (per cent)	61.3
Volatile combustible (per cent)	28.9
Fixed carbon (per cent)	7.7
Ash (per cent)	2.1
B.t.u. per pound, dry	8,170
B.t.u. per pound, available as fired	2,360

In burning this stored fuel the draft in the furnace must be considerably increased. For example, a certain boiler rating requiring a damper draft of 0.6 in. (15 mm.) with fresh fuel requires 0.9 in. (22.5 mm.) of draft when stored fuel is used.

Lightning Protection

Uppermost at

A.I.E.E. Midwinter Convention

Arrester and Ground-Wire Practice, Use of Petersen Coil and Protecting Windings Against Transients Receive Chief Consideration—Communication Problems, Performance of Rotating Machines and General Engineering Subjects Comprise Remainder of Program

PROTECTION against lightning and other disturbances was the subject of five of the most interesting papers presented before the midwinter convention of the American Institute of Electrical Engineers last week. Two other groups of discussions, appealing particularly to machine designers and communication engineers, referred to the performance of rotating machines and to printing telegraphy and submarine cable communication respectively. For the distribution and transmission engineer the papers on thermal conductivity of soil and further studies of corona hold much of value. Of the remaining papers, which were on general engineering subjects, the mathematical papers by Steinmetz and Karapetoff drew forth a considerable amount of discussion.

Features of most of the papers and summaries of those which were too abstruse to abstract are presented in the following sections.

SURGE PROTECTION

Analysis of Lightning Arrester Operating Practice

F. L. HUNT
Turners Falls (Mass.) Power & Electric Company

TO OBTAIN information regarding the prevalent practice of engineers and operating companies in the use of lightning arresters a short questionnaire was sent by the sub-committee on lightning arresters to members of the protective devices committee and to a few other operating engineers. The answers to this questionnaire are digested below:

GENERAL TYPES* OF LIGHTNING ARRESTERS RECOMMENDED FOR FEEDER CIRCUITS OF 1,000-KW. RATING OR GREATER

Voltage	Oxide Film	Aluminum Cell	Condenser Resistance Gap Parallel to Condenser	Compression Chamber	Horn Gap With Water Resistance	Bennett Type	No Arrester
10,000	16	15	1	1	1	..	..
33,000	16	14	..	..	1	..	1
66,000	14	13	..	..	2	1	1
150,000	13	13	..	..	1	1	1

*Out of the twenty replies, it should be noted that the majority of those recommending oxide film recommend the aluminum cell also.

Twelve replies express the opinion that there are no cases where arresters should be omitted entirely. Several state that they could be omitted on small substations or on short and unimportant lines. One recommends omitting arresters for 30,000 volts and over, one for 66,000 volts and over, and two for 150,000 volts and over. Another declares that arresters are not needed where apparatus of modern design is installed.

From the replies to the question "How many lightning arresters would you recommend and what general class of arrester would you specify for a substation feeding six 22,000-volt overhead circuits?" the following analysis was made: Thirteen recommend one arrester for each circuit, of which ten recommend the oxide film; five recommend one arrester on the bus; one recommends one arrester for each two circuits, and one recommends one arrester for each transformer bank.

Regarding the use of horn-gap lightning arresters on circuits of 10,000 volts and above, the following opinions were received: Eleven do not recommend this use in any case; four recommend their use on unimportant circuits from small stations; three recommend their use with resistance in series on circuits of 12,000 volts or over; one on 22-kv. circuits from substation; one on all circuits over 10,000 volts; and one on customers' small substations.

From an analysis of some of the reports on lightning arresters and from a study of their design, it appears that in order to insure the best protection one of the paths through the lightning arrester should be a high-current-capacity path, that is, a path that will allow a large current to flow at the time of lightning discharge. If such a path is provided, the arrester will have a lower maximum voltage across the terminals at the time of discharge than will be the case if the discharge capacity or rate of discharge is limited by the insertion of a resistor. It is possible that with a resistor in series the maximum voltage will be higher than the breakdown potential of the apparatus or cables which the arrester is intended to protect.

D. W. Roper emphasized the need of operating companies co-operating with the protective devices committee of the A.I.E.E. in studying methods of securing the most dependable operation from lightning arresters. He expressed the opinion that many so-called lightning arresters are being put on the market which do not perform the functions required of lightning arresters. To protect unwary purchasers, he suggested that the A.I.E.E. ought to define the functions of a lightning arrester very clearly or specify the performance desired.

Value of Petersen Coil for Suppressing Arcing Grounds

R. N. CONWELL AND R. D. EVANS
Public Service Electric Company, Newark, N. J., and the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., respectively.

ACCIDENTAL arcing grounds on transmission lines constitute one of the foremost problems to be solved in the transmission of energy over great distances. A device, known as the Petersen earth coil, advocated by Prof. W. Petersen of Germany for suppressing these accidental grounds has resulted in investigations and tests being made in this country to obtain additional information relative to the operation and limiting features of this coil.

The essential part of this new apparatus is a suitable reactor connected between the neutral of the circuit and ground. This reactance is chosen of such a value as to neutralize the capacitance of the circuits when an accidental ground of one phase takes place. Under this condition the reactor is electrically in parallel with the active capacitances, and the only current that flows to the combination of the inductance and capacitance in parallel is the current necessary to supply the energy loss in the combination. This energy current can be made very small, and it is this relatively small current that passes through the accidental arc to ground. If the ground is of the arcing type, the arc will, under favorable conditions, be extinguished, as the energy flowing through the fault is only that necessary to supply the losses in the resonant circuit. If the losses are low, the energy flowing through the fault will be insufficient to support an arc and the voltage of the resonant system will be gradually reduced to zero, while the voltage between the former faulty wire and ground will gradually rise to normal value.

The advantages of the Petersen earth coil system are, first, the suppression of arcing grounds under favorable conditions; second, the reduction of insulator trouble, and, third, the small earth current when a fault occurs to ground.

The disadvantages are, first, high potentials between line and ground due to series resonance; second, maintenance of a series of arcs under unfavorable conditions, that is, resonance and high loss, or large dissonance and either high or low loss; third, difficulty in obtaining selection of the faulty line by means of relay protection, and, fourth, reduced lightning protection due to the necessity of high settings of the neutral with abnormals or transients.

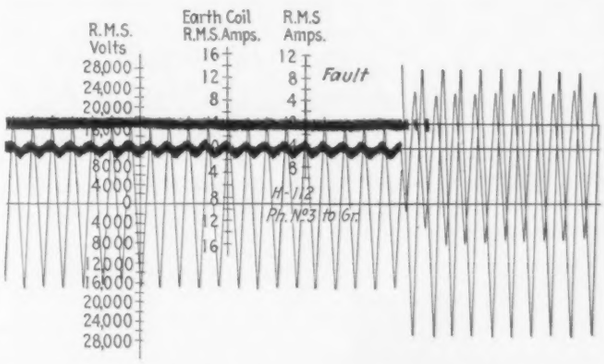
ORDER OF PREFERENCE OF FIVE METHODS OF GROUNDING A SYSTEM NEUTRAL.

(*v*) *Dead Ground*—Without the installation of resistance or reactance coils. (*w*) *Low Resistance Ground*—Two to four ohms. (*x*) *Critical Resistance Ground*—Resistance necessary to damp out the natural oscillation of the system. In general, this will be a high resistance compared to 2 to 4 omhs. (*y*) *Petersen Earth Coil*—A reactor tuned for resonance at fundamental system frequency with the capacity of the system to ground. (*z*) *Infinite Resistance from Neutral to Ground*—Ungrounded or free neutral system.

Effect on	Order of Preference 1	2	3	4	5
A—Voltage Stresses					
(*a*) At normal frequency	v	w	x, y, z		
(*b*) Due to arcing grounds	x, y	v, w	z		
(*c*) Due to lightning	v	w, x	y, z		
B—Current stress	z	x, y	w	v	
C—Relay operation	v	w	x, y, z		
D—Continuity of service	v	w	x	y	z
E—Cost:					
(*a*) Insulation of power system	v	w	x, y	z	
(*b*) Grounding devices	z	v	x	w	y

Considered from the viewpoint of effect on voltage stresses, current stresses, relay operation, continuity of service and cost, the methods of grounding the neutral of a system rank in the following order of preference: First, dead ground; second, low-resistance ground, and, third, critical resistance ground, or the Petersen coil. A more detailed comparison of five methods of grounding is given in the accompanying table.

In the discussion of this paper, W. W. Lewis gave the results of some investigation with the Petersen earth coil that he had made on a 100-mile transmission circuit of the Alabama Power Company. He found that the coil was useful as an arcing ground suppressor, but that practical operation was confined to transmission at a comparatively low-voltage and medium distance. L. P. Ferris said that any unbalance in the capacity of a line could be corrected by the transition of the wires. In this way the proper value of inductance for the coil could be determined so as to produce a resonant circuit with the line capacity of each phase. Mr. Lewis also pointed out that the effects of the Petersen coil are very similar to those of the isolated or free neutral system except in case of insulator flashover when the former adequately suppressed the arc.



EFFECT OF PETERSEN COIL WHEN ONE PHASE IS GROUNDED

The upper curve (right scale) indicates the current in the fault. The current is zero until the phase is grounded, when it rises to a peak value of 7 amp. The middle curve (middle scale) indicates the current in the earth coil which rises from 1.5 amp. under normal conditions (due to unbalanced condition of phases) to 16 amp. when phase is grounded. The lower curve (left scale) indicates the voltage of the non-grounded phase, which rises from Y voltage to Δ voltage when the phase is grounded.

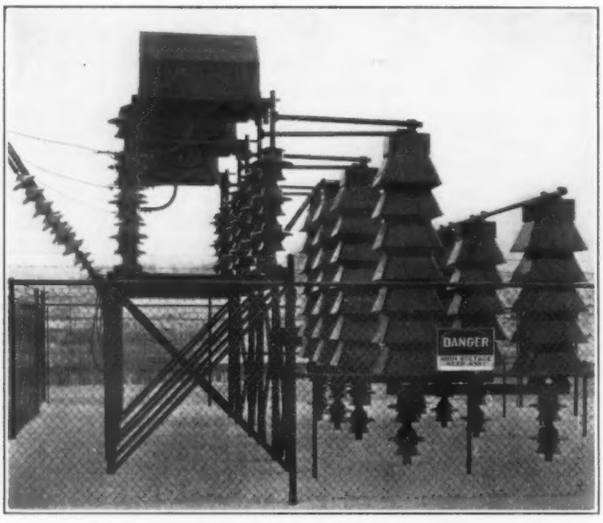
A Defense of Standard Practice in Lightning Arresters

E. E. F. CREIGHTON
General Electric Company, Schenectady, N. Y.

IN A RECENT investigation conducted by the protective devices committee criticisms were received of current lightning-arrester practice as applied to transmission lines. This paper is an endeavor to answer such questions of practice and criticisms of standard arresters.

For the most part practice in lightning arresters is standardized. In fundamental principles there have been no changes for many years, though improvements in details, especially of construction, are still being made. The oxide-film arrester gets rid of the oil and electrolyte and avoids the necessity of daily charging, but fundamentally it is designed along the same prin-

ciples as the aluminum arrester. The important principle is the electric valve action—there are but a few milliamperes of discharge at normal line voltage, but at abnormal line voltages the discharge current rises to hundreds of ampheres. In answer to criticisms made by a few prominent engineers, it is maintained as fundamental that a high discharge rate for an arrester is an absolute essential. The burden of proof falls on those engineers who use arresters of low discharge rate. These arresters cannot discharge the dangerous lightning surges on overhead lines since the current in a traveling wave is about 2 amp. for every thousand volts of lightning potential. Since there are lightning arresters of low discharge rate in apparently satisfactory use, an explanation for this anomaly is found in the use of insulators of low arc-over voltage. Either the lightning potential is relieved locally at the insulator or the resultant traveling wave is of too low voltage when it reaches the transformer greatly to endanger the insulation. However, such poor line insulation is not a solution of the problem of continuity of service.



LIGHTNING ARRESTERS MUST HAVE LARGE DISCHARGE CAPACITY AND NOT REQUIRE MUCH ATTENTION

How many arresters should be used to protect a six-feeder system? It depends on the conditions of insulation in circuit breakers and the importance of continuity of service. According to the conditions discussed, from one to seven arresters with auxiliaries are needed.

The use of no arresters was discussed in this paper from three standpoints—(1) if it is contended that lightning is not of sufficient voltage to cause damage; (2) if it is considered a better investment to put lightning-arrester money into spare transformers; (3) if it is considered good practice to insulate a transformer so highly as to give it immunity from lightning. The conclusion reached was that each of these three suppositions is faulty and dangerous.

A new method of inspection of aluminum arresters was proposed, based on the fact that the power factor of the cells varies considerably according to their condition. There are promises of effecting economies in overhauling aluminum arresters and of lengthening their life. Experiences with a 33-kv. arrester in service thirteen years without overhauling were given. The plates are still in good condition. The usual damaging deposits of decomposed oil on the aluminum film were prevented by using an initial rush of charging current.

A brand new development in lighting arresters was announced by Dr. Joseph Slepian, who described a valve type of arrester which involves some rough-surface high-resistance electrodes in contact with each other. This construction interposes minute air gaps which break down at 350 volts due to a glow discharge.

Prevention of Transient Voltage in Windings

J. MURRAY WEED
General Electric Company, Schenectady, N. Y.

THE production of transient voltages in ordinary windings such as are used in transformers, reactors and similar instruments is due to faulty arrangements of inherent capacitance with the inductance of the winding. The fundamental principle whereby the resulting non-uniform voltage distributions and oscillations may be eliminated may be stated as follows: If the capacitance associated with any inductance is so disposed that the initial distribution of a suddenly impressed voltage, which is effected by the capacitance, is uniform with respect to the inductance, the growth of a current within the inductance will be uniform, and the voltage distribution will therefore remain uniform, each element of capacitance receiving charge at the same rate that it loses it.

A general method of constructing windings with ideal distribution of inherent capacitance consists in inclosing or embedding the entire winding within the dielectric of a suitably proportioned condenser, the terminal plates of the condenser being connected to the terminals of the winding, and each turn of the winding being so positioned that, with uniform voltage distribution, its potential will be the same as that which would exist in the part of the dielectric where the turn is located if the winding were not present.

In case of cylindrical layers two cylinders would be required within which the windings would be placed, as described in the foregoing paragraph, with the outer cylinder and the inner cylinder connected to the outer and inner terminals respectively. With the multi-coil winding the top and bottom terminal would be connected respectively to circular plates placed at the top and bottom of the winding.

Economic Value of the Overhead Grounded Wire

E. E. F. CREIGHTON
General Electric Company, Schenectady, N. Y.

THE necessity of the overhead grounded wire is now less apparent than formerly. In the early days it was needed to assist lightning arresters, but today arresters have a sufficient discharge rate not to require the assistance of the grounded wire. Investigation shows that the overhead grounded wire protects only for a specifically limited range of voltage. It is no protection for induced voltage below the normal arc-over value of the insulator and no protection when the induced voltage is sufficient to arc over the insulator. Appraisal of the weight to be given to the various functions of the overhead grounded wire and consideration of its cost lead to the conclusion that, barring exceptional cases, it is an actual detriment when placed on semi-insulating structures such as wooden-pole lines.

When used on this type of construction it actually lowers the arc-over voltage of lightning.

On a metal tower the overhead grounded wire loses its ability to protect against arc-over of insulators in proportion to the earth resistance at the legs of the tower. Metallic connections of a tower of high earth resistance to an adjacent tower of low earth resistance have little if any beneficial effect in protecting the insulator from lightning as the horizontal distance is too great.

On a grounded neutral system experimental tests of a short circuit of a single phase showed the necessity of connecting the overhead grounded wire to the station connection to reduce the earth resistance to a safe value. Otherwise the neutral voltage rose so high during short circuit as to jump-spark into the low-voltage wiring, blowing fuses and affecting the switch control.

Looking to the future, the overhead grounded wire, by lowering the general resistance to accidental short-circuit currents, will have a valuable function in connection with arc suppressors. This function is really the one already recognized as an aid to proper operation of relays.

VALUE ON WOOD POLES QUESTIONED

As applied to metal structures the analyses do not bring out any detrimental function of the overhead grounded wire. It is not condemned in this use but attention must be directed to its limitations. The cost of the overhead grounded wire is a considerable factor. At maximum it now seems that for most cases one grounded wire is enough. Exceptional cases and conditions must be decided by detailed consideration.

On non-metallic structures the overhead grounded wire is not needed as an aid to lightning arrester. Instead of protecting, it actually lowers the arc-over of insulators subjected to a lightning voltage. The overhead grounded wire is not needed for mechanical strength where pin-type insulators are used. It is detrimental in increasing the wind and sleet load. It may find some use as a low-resistance earth connection, but is it needed to localize faulty insulators? Not where wooden pins are used, and it is of possible but doubtful economic use where metal pins are used.

As an absorber of traveling waves the overhead grounded wire is useful but not necessary. It is not needed to aid distant arresters. It is not necessary for isolated installations of transformers along the line which has no arresters. There are other and cheaper ways of getting protection. The overhead grounded wire may be used if desired near a station, with special precautions in construction, for use against direct stroke and yet save the expense for the rest of the lines.

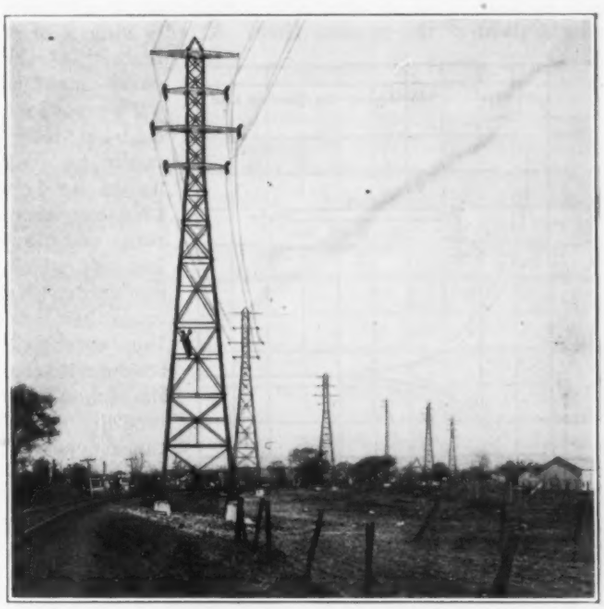
As a return wire and a parallel conductor to lessen the scattered electrostatic field, the overhead grounded wire has its normal useful function. Except for very high voltage, prominent harmonics, and near parallel telephone lines, this factor will seldom justify the expense, however.

In bringing the zero potential of the earth from its surface to the height of the power lines the installation of an overhead grounded wire on an insulated structure is very detrimental. It reduces the arc-over voltage from the power wire to ground. This is the factor which seems sufficiently prominent to condemn the use of the overhead grounded wire on wooden structures.

Both agreement and disagreement with Dr. Creighton were voiced in the discussion of his paper. W. W. Lewis contended that the experience of operating companies does not bear out the conclusions above, the Southern Power Company, for example, having found ground wires of considerable value on 44,000-volt and 33,000-volt lines in preventing splitting of wood poles and in giving mechanical support thereto. The Utah Power & Light Company, too, has found that wood poles are shattered where not protected by ground wires. This trouble has been prevented in some cases by the use of grounded bayonets or bands around the tops of the poles.

C. L. Fortescue expressed the belief that overhead grounded wires will give adequate protection where properly installed and maintained, because the increased capacity to ground which they afford should limit potential rises on the system. He pointed out that the Byllesby Engineering & Management Corporation is continuing the use of ground wires.

Dr. C. P. Steinmetz agreed with Dr. Creighton regarding the facts presented but disagreed with him in his conclusions. He declared that if he were given the choice between an overhead ground wire with no lightning arresters and lightning arresters with no ground wire, he would choose the ground wire if properly installed and maintained. The two most important functions of the ground wire, in his opinion, are its ability to reduce induced voltages and to dampen the effect of traveling waves. While the ground wire may reduce induced potentials only 40 per cent, the ground wire may be effective in eliminating 90 per cent of the troubles because the reduction in supervoltages will bring them close to the value which high-voltage apparatus can withstand. In cases of very large power circuits where the total resistance is low there may be danger from heavy line surges.



ON METAL STRUCTURES GROUND WIRES ARE NOT DETRIMENTAL, BUT MAY BE ON WOOD POLES

E. P. Peck was one operating engineer who agreed with Dr. Creighton. According to a questionnaire sent to the major operating companies, he declared, about fifty were against ground wires while only eleven were in favor of them. Furthermore, he declared that his experience in the South showed no value in ground

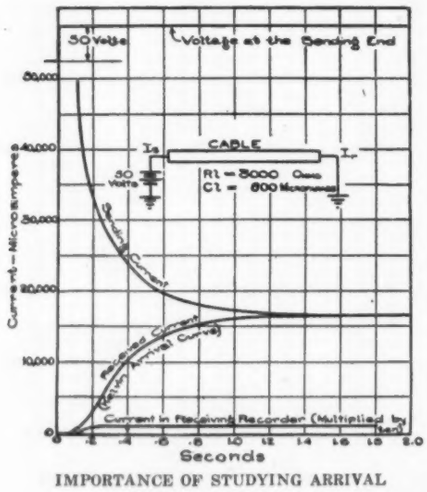
wires, whereas they may be detrimental because they establish ground potential too close to the conductors, and reduce the insulation afforded by the wooden structure supporting the lines. As a result, on wooden pole lines a number of pins and crossarms were burned and insulators damaged.

COMMUNICATION

Résumé of Submarine Cable Telegraph Practice

J. WILLARD MILNOR
Western Union Telegraph Company, New York

DESCRIPTIONS of apparatus used in modern submarine cable telegraphy and some of the limiting conditions of operation were given by the author, who also developed a method of analyzing the action of cables and various types of apparatus which may be regarded as standard at the present time. After giving a brief history of the development of submarine cable telegraphy he took up in order the construction and laying of cables, duplexing, the cable key and the automatic transmitters, the siphon type recorder and three types of magnifiers, an equal number of telegraph relays, and the shaping of signals. Under limiting conditions of operation he considered the sensitiveness of receiving apparatus, the duplex balance, effect of extraneous currents and magnetic storms, and the desirable sending voltage. The theory of cable operation was considered from the viewpoint of arrival-curve analysis and frequency characteristics of cables and sending and receiving apparatus.



IMPORTANCE OF STUDYING ARRIVAL CURVES IS EMPHASIZED

Considering the duplex balance, the author outlined the theory of operation, accuracy requirements and operating difficulties. He concluded with a discussion of artificial lines and the applicability of Kelvin's KR law to submarine telegraphy.

Longest and Most Deeply Submerged Telephone Cable

W. H. MARTIN, G. A. ANDEREGG AND B. W. KENDALL
American Telephone & Telegraph Company and Western Electric Company, New York

THE Key West-Havana submarine telephone cable system, which is 104.9 nautical miles long and 1,000 fathoms deep in some places, was described in this paper. Three single-core, continuously loaded cables are involved, each of which provides, in addition to a telephone channel, direct-current and carrier-current duplex telegraph channels. A description was given of the design and construction of the cables, the methods of superposing the various channels on each cable and the terminal apparatus. A feature of the cables is the copper taping used to diminish the loss caused by sea return.

In discussing this paper, B. Gherardi pointed out that continuous loading was chosen because of the mechanical limitations and excessive maintenance expense of coil loading. Dependability of service was the chief requirement influencing the use of single-conductor cable with metallic-ground return.

Printing Telegraph Applied to Factories, Banks, Railroads, Etc.

A. H. REIBER
Kleinschmidt Electric Company, Brooklyn, N. Y.

SOME of the economic principles which determine the applicability of the automatic printing telegraph to present-day communication problems were considered by the author of this paper. The discussion was limited to those forms of light-traffic-load systems which have been developed particularly for linking together the departments of a factory, the terminal points of a railroad, the branches of a bank or the units of any other large corporations. A description was given of the principles of operation of three systems, namely, the Morkrum "green-code" system, the Western Electric "start-stop" system and the Kleinschmidt system.

The three most important savings effected with printing telegraph systems are saving of time, line wire and labor. Three examples were given illustrating these points. The first took the case of a concern where orders are received at a central point but filled in different departments in the same plant. Ordinarily such orders are sent to the first department, where certain articles are placed on a truck together with the orders. The truck is then sent to the next point, where additions are made, and so on until the truck passes through all stations involved. By using the printing telegraph the orders to the different departments may be sent simultaneously and automatically while making out the invoice.

To illustrate a condition where line wire may be saved, a condition was assumed involving a need for rapid transmission of a fairly large volume of traffic from New York to Chicago. If Morse operators were placed at each point, an average of between thirty and forty words per minute would be the most that could be handled. Furthermore, to handle the traffic two line wires would have to be leased. The cost of the wires with two Morse operators at each end would be approximately $47,200 per year. By using automatic equipment the same traffic could be easily handled and $20,000 per year would be saved.

Perhaps the best illustration of how a saving of labor can be effected by the installation of automatic equipment is the case of press associations. At one time a well-known press association employed as many as 100 messengers to deliver news to various newspapers scattered throughout a city. Light-traffic-load printing telegraph systems are now giving these papers far better news service, and by means of periodic inspections a few maintenance men keep the equipment in order.

Calling attention to the extent to which the automatic printing telegraph has been applied to commercial com-

munication, R. E. Chetwood pointed out that 185,000 miles of the Western Union trunk system is equipped with this apparatus. If it had not been used probably 460,000 miles of line would have been required. This equipment handles 75 per cent of the trunk-line traffic.

ROTATING APPARATUS

Mechanical Device Indicates Performance of Induction Machines

VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

A KINEMATIC device called the "Indumor," which represents the vector diagram of a polyphase induction machine, is described in this paper. The parts are made to assume at will different positions corresponding to different loads of an induction motor or generator. The primary and the secondary constants, the magnetizing current and the core loss are also adjustable at will. The device permits the visualization of the performance of an induction machine and can be used for a study of a given machine or for a selection of the constants to give the desired performance characteristics of a new machine.

Application of Current Locus to Single-Phase Induction-Motor Calculations

J. K. KOSTKO
Wagner Electric Manufacturing Company, St. Louis, Mo.

THE principal applications of the current locus of single-phase induction motors are the predetermination of the performance of a projected motor on the basis of its constants and the determination of the performance and constants of an existing motor on the basis of a few simple tests. In his original paper the author treats these problems by a method which is believed to combine accuracy with comparative simplicity—the latter at least, to the extent which can reasonably be expected when dealing with apparatus of such inherent complexity as the single-phase induction motor.

Heating of Railway Type Motors in Service and on Test

G. E. LUKE
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

THE heating and cooling characteristics of railway motors, with a brief analysis of their heating at standard ratings, were discussed in this paper. The author also developed the fundamental equations defining the temperature rise of a motor on a continuous or short-time load. Applications of these equations were made in several specific examples. In his concluding remarks the author made the following observations: The copper in the armature has relatively little thermal capacity which may result in high internal temperature gradients on short-time loads. As the ventilation of the motor is increased the ratio of the one-hour to the continuous rating approaches unity. The application of the ventilated motor on the basis of the average root-mean-square current to an intermittent duty is incorrect if the maximum internal temperature at the peak load is ignored.

The nominal rating as defined by the Standards of the A. I. E. E. is a fictitious rating since it specifies the run to be made under abnormal conditions of ventilation.

As an index of motor heating, M. R. Hanna recommended the use of the ratio of heat dissipated to the total heat absorbed. In considering the maximum temperature allowable during the peak load, the length of their period must be considered. Mr. Luke said that one-third to one-fifth of the total heat dissipated was by radiation.

F. W. Peters said that the percentage of failures due purely to overheating was small. Many failures that seemed to be due to overloads often were caused by defects in the motor itself, such as breaking down of insulation due to a loose coil or the accumulation of moisture.

Causes of Flashing of Synchronous Converters

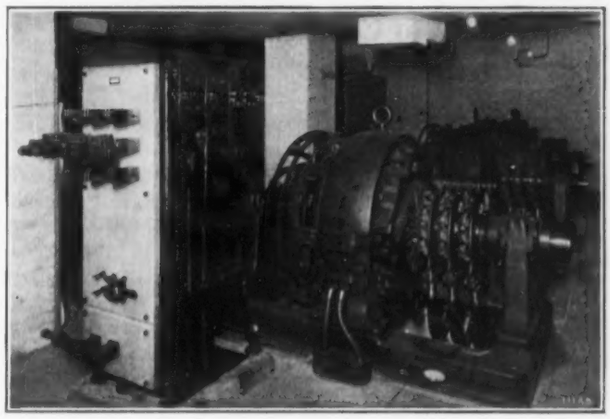
E. B. SHAND
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

HEAVY load surges in synchronous converters produce unbalanced armature reactions and abnormal voltage conditions on the commutator, thus constituting one of the chief causes of flashing, according to extensive studies made by the author. To increase the momentary overload capacity the following main lines of progress were suggested:

(1) The improvement of synchronous characteristics of the converter installation to obtain high stability and the reduction of the moment of inertia of the rotating masses of the converter.

(2) The reduction of the effectiveness of the unbalanced reactions in producing high voltages in the commutating zone. (High-reluctance commutating poles are an instance of this.)

(3) The prevention of the complete propagation or



CONVERTER FLASHING CAN BE PREVENTED BY CONSIDERING FACTORS NAMED ABOVE

culumination of the arc by the insulation of conducting parts around the commutator by means of flash-guards and other devices.

(4) The limitation, by external means, of the maximum severity of the surges thrown on the machine (in which might be included the high-speed circuit breaker.)

These principles have been utilized in devising suitable means of improving the characteristics of commercial types of 60-cycle railway converters.

Heat Losses in Stranded Armature Conductors

WALDO V. LYON
Massachusetts Institute of Technology, Cambridge, Mass.

THE solution of the problem of heat losses in stranded conductors embedded in rectangular slots may be accomplished by the use of complex hyperbolic functions. In using this method allowance can be made for the number of strands in each conductor and for the effect of insulation between strands. The currents in the strands are equal to those in corresponding divisions of a solid conductor of the same depth, making it possible to determine this current up to any strand by means of integration. If this were not so, the current would have to be found by a summation of vector quantities—a much more difficult solution.

The author gives a mathematical analysis of the problem in his original paper.

Analysis of Energy Loss in Polyphase Commutator Machines

A. B. REED
Metropolitan Vickers Electrical Company, Manchester, England

THE energy losses in frequency changers having armatures similar to those of synchronous converters were analyzed in this paper. The author pointed out that these losses depend upon the degree to which the currents flowing into or out of the commutator or slip rings compensate one another. Taking account of the time and space overlapping of the currents, the author gave the results for different numbers of phases and power factors.

GENERAL ENGINEERING

Phenomena of Condenser Discharge Through an Air Gap

CHARLES P. STEINMETZ
General Electric Company, Schenectady, N. Y.

THE usual equations of the condenser discharge through an inductive circuit, as given in textbooks, give an oscillation of progressively decreasing amplitude if the circuit resistance is less, and an impulse or unidirectional discharge if the circuit resistance is more, than twice the surge impedance. They apply only for the case in which the resistance of the circuit is constant—that is, independent of the current—and therefore do not apply to the very common case in which the discharge circuit includes a spark gap or consists largely of a gas path (as in the case with the lightning flash). Experience shows that the phenomenon is essentially different.

The author has made a mathematical study of this phenomena and developed some general discharge equations in a form somewhat different from previous publications on the subject. One of the conclusions arrived at was that the condenser discharge through an inductance of negligible ohmic resistance, but containg a gas circuit, is always oscillatory and consists of a finite number of half waves.

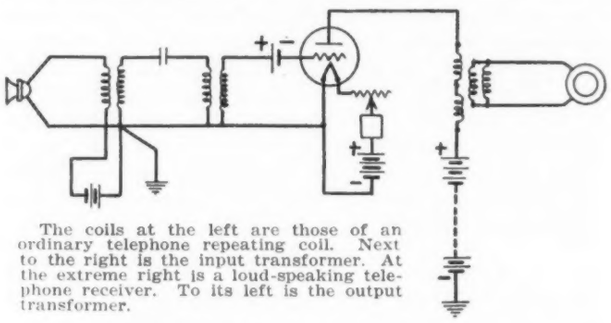
Professor V. Karapetoff offered an alternative equation to cover general electric circuits containing capacitance, reactance and variable resistance which has the form

$$L\frac{d^2i}{dt^2}+\frac{di}{dt}\left(r+\frac{dE}{dt}\right)+\frac{i}{e}=0$$

Amplifier and Loud-Speaking Telephone for Studying Corona Formation

J. B. WHITEHEAD AND N. INOUYE
Johns Hopkins University, Baltimore, Md.

BECAUSE of the rectifying and amplifying properties of the three-electrode vacuum tube when this tube is used with the corona voltmeter, an instrument described in previous papers of the Institute, very accurate and reliable measurements can be made of the wave form of the discharge due to the alternating corona.



The coils at the left are those of an ordinary telephone repeating coil. Next to the right is the input transformer. At the extreme right is a loud-speaking telephone receiver. To its left is the output transformer.

APPARATUS USED TO AMPLIFY THE SOUND OF CORONA FORMATION

Moreover, the sound due to corona can be amplified so that its first occurrence can be instantly detected by a loud-speaking telephone.

The method of detecting corona by means of the corona voltmeter, using a galvanometer with a telescope and scale, with or without a rectifying valve, while good, is inconvenient if the apparatus has to be moved from place to place. By amplifying the discharge with a vacuum tube a portable type such as the Siemens & Halske needle galvanometer can be used. In this way the corona discharge current is rectified and amplified so that a study can be made of the point where corona appears and also of the form the wave takes.

For amplification of the sound of corona the vacuum tube is connected as shown in the illustration. The greatest difficulty found in using this apparatus was to separate the pure corona note from other noises which were also picked and amplified in the loud speaker.

Five Hundred Tests on the Dielectric Strength of Oil

J. L. R. HAYDEN AND W. N. EDDY
General Electric Company, Schenectady, N. Y.

WHILE developing a dependable method of obtaining experimental data by means of a sphere gap in transil oil, considerable study was made of the behavior of oil under disruptive dielectric stress. It was found that the nature and character of the dielectric breakdown of oil may be entirely different from that of air.

Five hundred successive breakdowns were taken on a sphere gap in oil at the same gap setting. Because of the well-known inconsistency of breakdowns in oil these observations showed wide variation. A curve was

plotted to show the relation between the breakdown voltage and the number of breakdowns at each voltage. If the disruptive breakdown of oil is due to the voltage exceeding the dielectric strength of the oil, as is the case with air, it should be possible to represent such a curve of probable error, or "probability curve" as it is usually called, by an exponential equation. But this was found to be impossible, the most representative exponential curve being higher than the observations at higher voltages.

The explanation that suggests itself is that the disruptive breakdown of oil under dielectric stress is not due to the voltage exceeding the dielectric strength of oil, as is the case in air, but is due to something being carried into or produced in the dielectric field, which weakens the dielectric strength so as to cause a premature breakdown.

It was the opinion of most of those commenting on this paper that the tests on the dielectric strength of oil should be made with a different spark gap from that used by the authors, which consisted of two spheres of 1 cm. diameter with a gap of 2 mm. The gap, as proposed by the American Society for Testing materials, is made of 1-in. (2.54-cm.) flat disks, 0.1 in. (2.5 mm.) apart. Five tests on each of three samples of the same oil is deemed sufficient. F. W. Peek, Jr., said that tests made on oils with a gap of 10 mm. produced much more uniform results. Others discussing the paper were C. E. Skinner, A. B. Hendricks, F. M. Farmer, Dr. J. B. Whitehead, D. Du Bois, and Dr. C. P. Steinmetz.

Solution of Alternating-Current Problems Simplified by Imaginary Quantities

VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

CUMBERSOME and unwieldy expressions often result when an attempt is made to solve alternating-current problems by means of trigonometry. To simplify the solution of such problems the author suggests the use of exponential expressions of the imaginary variables, such as emf., current and flux. These may be selected of such magnitude and phase that, with the real quantities, they will give simpler mathematical expressions than the real quantities alone.

Skin and Proximity Effect In Tubular Conductors

HERBERT B. DWIGHT
Canadian Westinghouse Company, Ltd., Hamilton, Ont.

THE effective alternating-current resistance of tubular conductors is required by designers of radio installations, large underground cables with non-magnetic cores and electric furnace circuits. The skin-effect ratio for isolated tubes was given in one curve by the author. For stranded conductors the resistance must be multiplied by a ratio for the spirality effect. When the return conductor is near, a ratio for proximity effect must be used. A calculation of the proximity-effect ratio is compared with results of some tests.

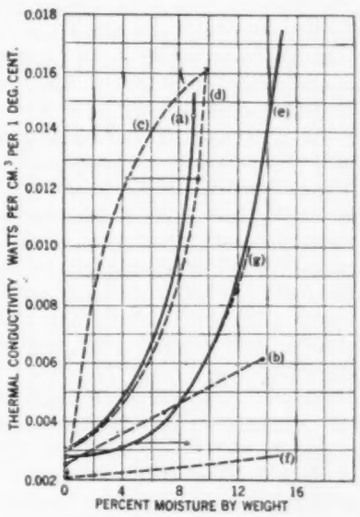
The conclusion was expressed that it seemed scarcely worth while providing a non-magnetic core with a 2,000,000-circ.mil, 25-cycle cable in order to reduce the skin effect, but that with the other cases considered, the tubular form seemed very advantageous.

Effects of Moisture on the Thermal Conductivity of Soils

G. B. SHANKLIN
General Electric Company, Schenectady, N. Y.

ONE of the methods to increase the carrying capacity of underground cables is to increase the thermal conductivity of the surrounding soil. Tests by the author prove conclusively that the presence of moisture in soils surrounding underground circuits is very effective in conducting away heat. However, it is immaterial what kind of soil surrounds the conduit so long as it will absorb and retain a sufficient amount of moisture.

Investigations with unsifted builders' sand of medium texture indicated thermal conductivities of 0.013 to 0.0154 watts per cubic centimeter per degree Centigrade for sand containing 9 per cent moisture, 0.0045 to 0.0055 watt with 4.2 per cent moisture, 0.0034 to 0.0039 watt with 1.6 per cent moisture, and 0.0026 to 0.0033 with 0.15 per cent moisture. From 9 to 10 per cent of moisture was the maximum that could be retained. Tests with pulverized yellow-clay subsoil showed a tendency to dry and cake around the heat-radiating source with a temperature as low as 50 deg. C. This caused a marked decrease in thermal conductivity.



MOISTURE IN SOIL* EFFECTIVE IN CONDUCTING AWAY HEAT

Much more satisfactory results were obtained with a mixture of two-thirds clay and one-third builders' sand. With 15 per cent moisture the thermal conductivity was 0.013 watt to 0.0194 watt per cubic centimeter per degree Centigrade, while with 8.5 per cent moisture or less the thermal conductivity lay below 0.0035 watt. It was found that finely divided sandy soil retains moisture much better than pure builders' sand.

In commenting on this paper, D. W. Roper said that a committee of the A. I. E. E. is studying this question in co-operation with the Massachusetts Institute of Technology. The primary object of the investigation is to determine the maximum working temperature of underground cable. R. W. Atkinson strongly advocated more research on the conductivity of soils. Commenting on the difference in results of various investigators, C. J. Fechheimer expressed the opinion that the reason for this divergence may be the heat-insulating action of air pockets and of air between the granules of soils. Others taking part in the discussion were W. A. Del Mar and G. E. Luke.

*(a) Clean yellow builders' sand (author); (b) fine white quartz sand, mesh 0.25 mm. (Kennelly); (c) clean yellow sand (Teichmuller); (d) curve c reconstructed; (e) yellow sand clay soil (author); (f) fine sandy soil (Kennelly); (g) normal or average sandy soil (Teichmuller).

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Sheldon Memorial Fund

To the Editors of the ELECTRICAL WORLD:

A few months ago, as already noted in your pages, the Sheldon Memorial Committee was organized to receive subscriptions toward a foundation in honor of the late Dr. Samuel Sheldon, professor of electrical engineering and physics at the Polytechnic Institute of Brooklyn, 1889-1920.

As chairman of the committee, I am glad to report that we are now turning over to the treasurer of the Polytechnic Institute $15,018, the sum so far paid in by more than 1,000 subscribers. There are still a few unpaid subscriptions, and we are hoping to secure enough further pledges to raise the fund to at least $20,000. Although the sum raised was hardly sufficient really to endow a laboratory, the corporation of the institute has ordered that the electrical measurements laboratory be known hereafter as the Samuel Sheldon Memorial Laboratory of Electrical Measurements, and its members have collected among themselves an additional $1,000 for immediate improvements and the installation of a memorial tablet. In this manner, the entire fund raised by our committee will be invested in the form of a trust and the income used perpetually for the maintenance of this laboratory, which will thereby become one of the best laboratories of electrical measurements in the country.

I wish also to note the general sentiments of esteem and admiration expressed concerning Dr. Sheldon, the loyalty of several hundred former students to his memory and the enthusiasm found within the splendid institution to which with such conspicuous success he devoted so many years of his life. T. C. MARTIN,

Chairman Sheldon Memorial Committee.

New York City.

Invention of Drawn Tungsten Wire

To the Editors of the ELECTRICAL WORLD:

On page 99 of the ELECTRICAL WORLD for Jan. 14, 1922, appears an anonymous article in which the following paragraph refers to the research that led to the production of the ductile tungsten-lamp filament:

"Dr. Coolidge of the research laboratory promoted a line of investigation and research in tungsten metal that covered a period of several years and resulted in the invention of drawn tungsten wire, a ductile, practically non-breakable filament. This advance in the art was patented Dec. 30, 1913."

The statement here made is misleading, as it was my own research and investigation and not that of Dr. Coolidge that led up to and "resulted in the invention of drawn tungsten wire, a ductile, practically non-breakable filament." COLIN G. FINK,

New York City. Research Engineer.

Further Comment on the Jobber Situation

To the Editors of the ELECTRICAL WORLD:

I was certainly glad to read your editorial of Dec. 31, which I think is one of the best I have ever read, and those of Dec. 24 and Jan. 28, which are also excellent. Frankly, I am somewhat surprised at your understanding of jobbing conditions and the clear grasp of the whole situation that you must have had to write these clear-cut editorials.

Your stressing the added service which the jobber renders in the selling of appliances is especially important and interesting and ought to be dwelt upon. There are two or three kinds of distributers—the warehousing distributer, the selling or pioneering distributer and the distributer who performs both functions. Anyway, I believe fully in your statement that the function of the distributer of appliances is largely in the "education and stimulation of the trade to the necessity of pioneering these commodities by creative selling and is one of greater detail and far greater cost.

The manufacturer who does not do his share toward maintaining permanent and economical distribution of electrical products during such a period of readjustment and liquidation of stocks as we have been going through by standing behind his regular distributers—who have probably done much to build up the market for his product by pioneering work at some time in the past—is making a mistake. The man who to artificially keep his output up to normal goes into the field and sets up other jobbers, with no protection to the old distributers and little attention to the permanent and economical methods of distribution, is certainly not on the right track to promote the good of the electrical industry.

Moreover, there is another "old-line" kind of manufacturer who depends upon "loyalty" far too much, and not enough on cold-blooded, sound business principles. This manufacturer is fairly loyal to his regular distributers, not often adding new ones to the detriment of the business of the regular distributers. He has the "loyal" support of his distributers. But he depends too much upon this loyal support regardless of competitive price conditions. In other words, both the manufacturer and his distributers suffer severely on account of the manufacturer's not keeping his prices competitive with the product of his competitor which has equal merit with his own.

I note your statement in your last editorial that the future of the electrical jobber is in the manufacturer's and his own hands. If the electrical jobber and the electrical dealer would get on more intimate terms and realize that their interest in the industry brings them naturally into a closer connection with each other than with any other branch, and that the particular job for them to do is to sell, exploit, pioneer and develop more successful plans of selling, it seems to me that many of our troubles with the manufacturer would take care of themselves and could be forgotten. If the selling end of the industry became in reality efficient, the old question of the manufacturer selling through other channels or to others than real jobbers would automatically disappear. Real selling, especially of appliances, is becoming more and more the one important function of the jobber and the retail electrical merchant. I am looking out for your editorials as they appear, and I am much interested in them. N. J. HARVEY,

Illinois Electric Company, President.

Chicago, Ill.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Ground Pipe Installed by Use of Piledriver

TO AVOID the laborious method of driving ground pipes at the base of poles by hand, the writer recently constructed a portable piledriver which cuts the old working time of two hours to ten or fifteen minutes, depending on the nature of the soil. Previously the driving of these pipes was done only with extreme difficulty, since the usual method required a man supported on a pole by climbers and safety belt to swing a heavy sledge. In such an awkward position the sledge mashes and bends the pipe, and owing to the vibration the man has difficulty in striking the pipe, often missing it and damaging the pole.

This piledriver consists of an old piece of line shaft about 3 in. in diameter and 18 in. long attached to a steel guide rod 8 ft. long which will enter a 1-in. pipe without rubbing. At the other end an eyebolt allows a rope to run through a pulley, mounted from the crossarm, to the ground man. By pulling down on this rope, as shown in the photograph, and releasing it the weight drives the pipe from 6 in. to 12 in. at a stroke. This method does not batter or bend the pipe and does not damage the pole, and it is also much safer for the operator than the old method.

GEORGE M. MILLER,
Superintendent Electric Distribution and Construction,
Louisville Gas & Electric Co.
Louisville, Ky.

Suggests Brush Change and Avoidance of the Presence of Oil

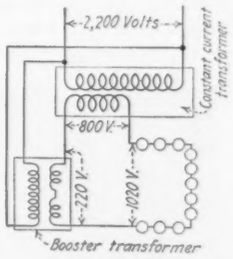
THE trouble which was related on page 289 of the Feb. 11 issue of the ELECTRICAL WORLD by E. C. Channing of Niagara Falls in the operation of a rotary converter is both unusual and interesting. It appears quite evidently to be due to mechanical rather than electrical causes. The filling up of the commutator slots with dust is not unusual, but rarely gives trouble owing to the width of the slots or the looseness with which the dust is packed. In this case, however, the dust appears to have packed in so tightly that the resistance between the bars became extremely low, causing a short-circuit. This may have resulted from the fact that the slots were too narrow, coupled with the presence of oil on the commutator, causing the dust to stick together and by degrees pack itself into a solid mass between the bars. The brushes would tend to deposit more dust in the slot, and the material probably built up in a sort of mound above the commutator level. The brushes in passing over this would spark and wear away the commutator by depositing a thin film of copper across the slot. This would appear to be the basic cause of the trouble.

As to the remedy. First, a brush engineer should be called in to determine whether a change in the type or quality of the brushes would not minimize the deposition of carbon dust, and, second, the experiment of "V-ing" out the commutator slots might be tried to allow more room for the secretions of dust and consequently a likelihood of its being dislodged readily. Above all, a very careful examination for oil on the commutator should be made.

T. F. BARTON,
Lighting Engineering Department.
General Electric Company,
Schenectady, N. Y.

Standard Transformer Boosts Series Circuit Voltage

SOME time ago a central-station company in the Middle West obtained a street-lighting contract in a small town for a total incandescent lighting load of 5.5 kw. The lamp load required 1,000 volts plus the voltage lost in the line wires. In checking over the available stock of constant-current transformers the distribution engineer of the company discovered that the only transformer reasonably near the size required was rated at 4.4 kva., 2,200 volts primary and 5.5 amp. secondary. At its full-load rating this transformer gave only 800 volts. The first thought was to connect a booster in the primary circuit, but the load conditions required that the primary be raised approximately 550 volts, or 25 per cent. Two considerations made this impracticable—first, a 25 per cent increase in the primary voltage would work the transformer iron too high on the saturation curve, and second, there was no transformer at hand having a 2,200-volt primary and a 550-volt secondary. These objections were avoided by connecting a booster on the secondary side of the constant-current transformer, as shown in the diagram. A standard 1-kva., 2,200/110/220-volt line transformer was used and so connected as to raise the secondary voltage 220 volts or slightly more than 25 per cent. This gave sufficient margin to enable the constant-current transformer to take care easily of any fluctuations due to the variations of the supply voltage.



STANDARD TRANSFORMER BOOSTS LIGHTING CIRCUIT

Fargo, N. D. H. S. RUSH.

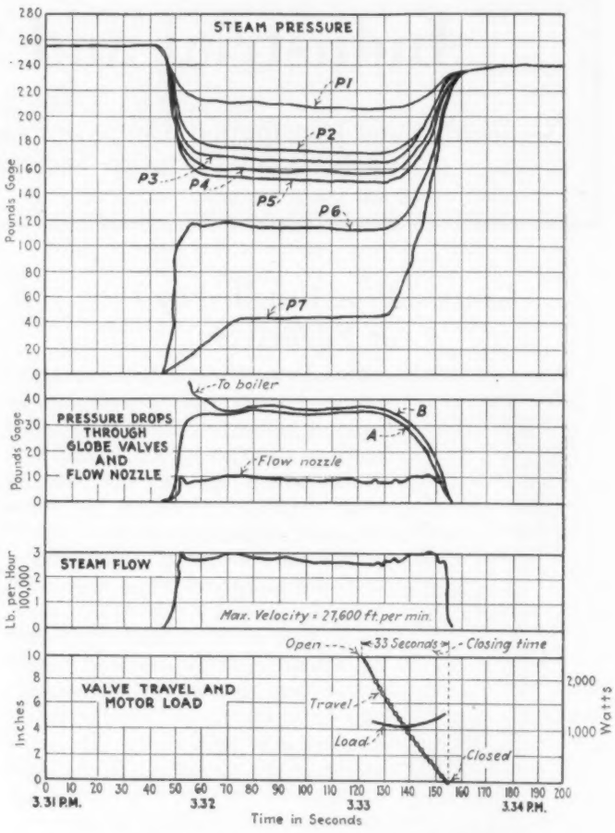
Emergency Closing Tests of Motor-Operated Valves

ALTHOUGH all the motor-operated valves subjected to the test reported on page 249 of the Feb. 4 issue of the ELECTRICAL WORLD successfully shut off the steam after discharging to atmosphere under high pressure, subsequent internal examinations have indicated that certain features of construction are desirable, and possibly necessary, if valves are called upon to close a number of times without intermediate overhauling. For example, machining of interior guides is advisable to prevent the valve disks from dragging across their seat before they are entirely closed. It also seems desirable to round the entering edges of the valve disks to reduce the possibility of seizure. Since some previous attempts to close motor-operated valves discharging to atmosphere under high pressure have not been successful, it is also likely that other features incorporated in the valves recently tested are particularly desirable, notably the ball-bearing yokes, nuts and extremely powerful closing motors. More details regarding the construction of these valves are given in the accompanying table.

As reported before, the tests were conducted at the Essex station of the Public Service Company of New Jersey under the auspices of the prime movers committee of the N. E. L. A. Technical Section, of which N. A. Carle is chairman. The actual conduct of the tests was carried out by Peter P. Dean, who is the manufacturer of the motor-operating equipment.

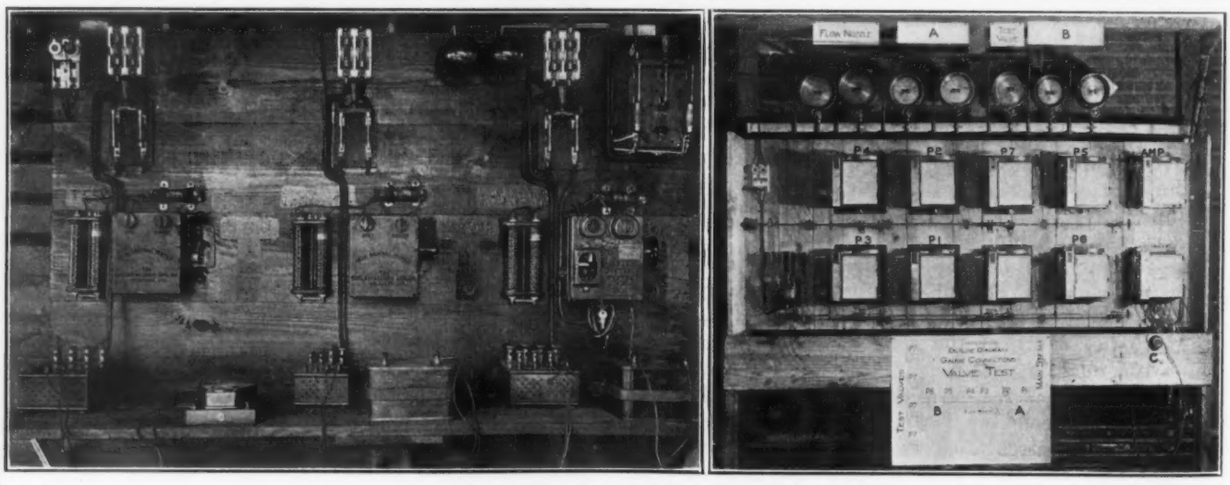
The test valves were controlled from a board arranged as shown in the accompanying illustration. The control at the right was permanently connected to the valve *A*, next to the main steam header; the control in the middle was permanently attached to the second globe valve *B*, and the control at the left operated the valve under test.

Graphic recording instruments, all driven from the same motor, were arranged as shown in another of the accompanying illustrations. The charts traveled uniformly at a speed of approximately 6 in. per minute during each test, registering the pressures at seven different points from the main steam header down to the valve under test. These points are marked *P*-1 to *P*-7 inclusive on the piping layout (shown below the instrument board), with corresponding markings on the recording instruments. The instrument at the right-hand side of the lower row was provided with twenty pens, of which eighteen were connected electrically to position contacts permanently attached to each valve ½ in. apart. Accordingly, an exact record of the time taken by a test valve to reach any point was recorded. The nineteenth pen on this indicator was connected electrically to a contact on the control switch operating the test valve, so that a record of the exact time of the closing and of the opening of the test valve-control switch was obtained. The twentieth pen was connected and during each test this button was pushed every ten seconds.



CONDITIONS WHICH EXISTED DURING THE TEST OF ONE 10-IN. GATE VALVE

In testing the gate valves steam was admitted from a



BOARD FROM WHICH VALVE TESTS WERE CONTROLLED AND INSTRUMENT BOARD ON WHICH CONDITIONS WERE RECORDED DURING TEST

22-in. main header, to which the 10-in. testing line was connected. Eight 1,278-hp. Babcock & Wilcox cross-drum, water-tube boilers with underfeed stokers were used during this test. In order to maintain full boiler pressure of 225 lb. and 150 deg. Fahr. superheat with free blow to atmosphere through one 10-in. opening, it was found necessary to operate these boilers at approximately 150 per cent of rating.

FEATURES OF FIVE VALVES WHICH WERE TESTED

A—10-in. cast-steel gate valve with "monel-metal" mountings, ball-bearing yoke nut and double-disk gate with taper seats.
B—10-in. cast-steel gate valve with "monel-metal" mountings, ball-bearing yoke nut and solid-wedge gate with taper seats.
C—8-in. cast-steel gate valve with "monel-metal" mountings, ball-bearing yoke nut and solid-wedge gate with taper seats.
D—6-in. cast-steel, single-seated gate valve with nickel trimmings with internally hinged disk closing with the pressure (special importation).
E—10-in. imported cast-steel gate valve with outside guides, parallel seats, double-disk gates and mountings of "platinum."

As reported in the Feb. 4 issue, the gate valves closed in forty-seven to fifty-five seconds, with a boiler pressure aproximating 225 lb. and a superheat about 150 deg. Fahr. One high-speed test was conducted with a 10-in. valve in which the closing time was reduced to twenty-seven seconds. Steam discharged at the rate of 308,000 lb. to 340,000 lb. per hour with the 10-in. valves entirely open. The maximum steam velocity was 27,600 ft. per second.

At some future date further tests may be conducted on larger size valves to ascertain if any further modifications in construction are desirable.

Public Service Production Co., Newark, N. J. T. W. STINSON, Consulting Mechanical Engineer.

Non-Ventilated Units for Lighting Show Increase in Use

TESTS made on indirect and semi-indirect lighting units show that, when ventilated, the temperature of the lead-in wires is appreciably raised above that for non-ventilated units. A natural inference would be that the more a fixture is "ventilated" the cooler it will run, but experiments show that this is not always the case.

There is a growing tendency toward the unventilated unit since it has a decided advantage in that it may be made dust-proof and is usually of better appearance. There has for a long time been an erroneous impression abroad that the life of an incandescent lamp is appreciably shortened by a high surrounding temperature, owing to increased operation of the filament temperature. Theoretically the filament temperature is increased, but this increase is so small relatively at 2,500 deg. to 2,800 deg. C. as to be unnoticeable even on a precision life test. It probably is for this reason, to some extent, that inclosed units for gas-filled lamps have all been ventilated. The disproving of this idea and the general progress in design for cleanliness, maintenance of candlepower, appearance, accessibility, etc., account largely for the growing tendency toward non-ventilated units.

It has also been shown that ventilating inclosed units does not necessarily cool the wire entering the socket. Much depends upon the design and type of the unit. Ventilation frequently creates a "chimney effect" which causes the hot gases to rise around the parts of the base and socket which it is desired to keep cool. Heat can also be dissipated by radiation as well as ventilation, and in units which are well designed from the standpoint of radiation ventilating holes often actually cause an increase of temperature at the wire.

Some units have been designed to be used without ventilation. Ventilation holes allow dust to be drawn into the unit by hot-air circulation and defeat the purpose of the design, which was to eliminate the collection of dust in the semi-indirect bowl, to provide ease of maintenance and to prevent a rapid drop in efficiency.

A 200-watt unit having a metal housing of the socket at the top, a large broadly flaring glass bowl and a metal-bottom plate was tested under different conditions of ventilation to determine exactly what effect ventilation had upon the operating temperatures of the lamp and the lead-in wiring. This unit was made and intended for use with no ventilating holes. Five conditions were tested as follows: (a) Non-ventilated, in its ordinary commercial condition; (b) ventilated by holes in the top cap and in the bottom plate; (c) ventilated by holes in the top cap only; (d) ventilated by holes in the top cap, bottom plate removed; (e) ventilated by holes in the tube and bottom plate.

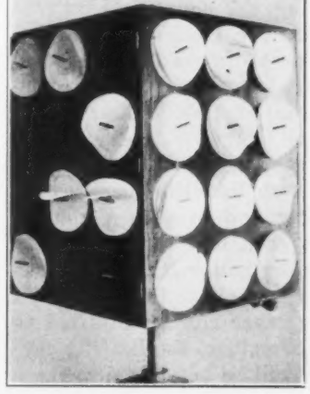
The results showed conclusively that the lamp-bulb temperatures were not unduly high and were reduced only about 6.4 deg. even by the maximum ventilation.

The important fact, however, is that ventilation in every case raised the temperature of the wire just above the socket, and the more ventilation there was the hotter this wiring became. Thus, under conditions (b) and (d), as described above, the wiring was 10 deg. hotter than in case (a), where no ventilation was provided.

The explanation is that the ventilating holes permit currents of hot air to rise through the fixture, carrying the heat to the top and thus heating the connecting supply wires. When there are no such air currents inside the fixture, this effect is avoided and the heat is dissipated chiefly by raidation from the outer surfaces.

National Lamp Works, Nela Park, Cleveland, Ohio. CHESTER L. DOWS.

Revolving Chart Cabinet for Records



BY ROTATING CUBICAL PANEL, CHARTS CAN BE EASILY FILED OR INSPECTED

A CONVENIENT chart cabinet of simple but effective design is in use at the Webster Street Station of the Worcester (Mass.) Electric Light Company. As shown herewith, it consists of a box 42 in. square and 4 ft. 5 in. high, of ¾-in. stock, mounted on a 2½-in. pipe pedestal which can easily be moved from one location to another. On the faces of the cabinet are inclined wooden pins for holding various circular charts from the boiler room and other apparatus. There are four interior shelves for holding supplies of any nature. One-half-inch pins 3 in. long are used for the most part, and the four faces equipped with pins will easily carry 13,000 charts, to say nothing of the inside storage space now used for coal-testing records, samples, etc.

Worcester Electric Light Co., Worcester, Mass. E. H. PERRY.

Testing Installed Generators to Determine Temperature Ratings

SOMETIMES, especially in these days of both 40-deg. and 50-deg. machines, it becomes necessary to check the temperature ratings on generators after they are installed. Where extreme accuracy is not necessary the tests are comparatively easy to make by means of thermometers placed on different points of the core and winding. The hottest points should be selected, and the thermometer bulk must be covered with putty, waste or other heat insulator.

There are two satisfactory methods of making such a test on a direct-current machine. First, the generator can be loaded by means of a water barrel, the entire power generated being dissipated as heat; second, the generator can be loaded by short-circuiting the terminals and building up the field until full-load current is reached. The latter method can be applied only to interpole machines. The generator terminals are short-circuited at the bus so that the armature current can be read on the switchboard ammeter, and the shunt field is separately excited. In the case of a compound-wound interpole machine the series field must be reversed. After increasing the shunt-field current until the current in the armature is full-load current a run is made until the temperature readings are constant. The temperature of the armature winding, armature core, commutator and series field will be nearly but not quite what would be obtained under normal full-load conditions. If the generator has a shunt field with the coils divided in half so that they can readily be connected up independently and in such a manner that the fluxes generated by each half tend to oppose each other, then, if a little over half voltage be placed on one coil (the coil with flux opposed to the series-field flux) and the voltage on the other coil be adjusted to give full-load current in the armature, the heating conditions of the whole machine will be very close to those obtained under normal full-load conditions.

In the case of an alternating-current generator, if a rheostat of sufficient size is not available, the generator may be tested by connecting to a distributing system fed by other generators. The total rating of the other generators should be large compared with the tested generator, otherwise the tested generator may raise the frequency too high.

Where a separate generator may be used for the test, it must be at least as large as the tested generator. The two generators are brought up to normal speed and voltage and synchronized. By increasing the field on the generator to be tested and by decreasing the field on the other generator until full-load current is obtained at normal voltage, then the temperature of the machine under test will be a little higher than would be obtained under normal full-load conditions.

An example of the need of such a test and the readings taken are illustrated by the following recent case. A manufacturer shipped three 192-kw., 0.8 power factor, 2,300-volt, 52.2-amp., 60-cycle, two-phase generators which were supposed to be 40-deg. machines. Through an oversight at the factory these machines were supplied with nameplates stamped "50-deg. C. rise continuous."

HEAT RUN TEST ON ALTERNATOR
Rated 192 Kw., 0.8 Power Factor, 2,300 Volts, 52.2 Amp., 60 Cycles, Two-phase

Time	Alternator No. 2 (Overexcited) Stator Volts	Stator Amp.	Field Amp.	Temperatures, Deg. C. Core 1	Core 2	Core 3	Winding, Collector, Ring End 4	5	6	7	Winding * 8	Alternator No. 1 (Underexcited) Field Amp.	Temperatures, Deg. C Core 1	Winding, Coll. Ring End. 2	3	Room Temp.
11.30	2,300	42.2	66.5	....	....	....	....	....	....	....	....	4.0	....	..	....	30.5
12.00	2,275	52.0	67	52	51.8	54	54	55	55	54	....	4.5	50	..	52	32
12.30	2,275	52.2	68	60	59.2	61.5	59	59	59	58	....	4.5	56.7	..	55	32.2
1.00	2,275	52.2	68	63.5	62.5	65	61	61	61	59.5	....	4.5	59.5	..	57	33.5
1.30	2,275	52.1	68	65.2	64.2	67	62.5	62.5	62.5	61	....	4.5	61	..	58	34.8
2.00	2,275	52.2	68	66.7	66	68	62	62	62	61	....	5.0	62	..	57.5	35
2.30	2,300	52.0	68	66.5	65.8	68.3	62.5	62.5	62.8	61.3	....	5.0	62.2	..	58	35.5
3.00	2,275	52.5	67.5	67	66	68.8	62.5	62.5	63.5	62.2	....	5.5	62.5	..	59	35.5
3.30	2,275	52.2	68	67	66	69	62.5	62.5	63.5	62.2	....	6.0	62.5	..	58.5	35.5
Read at shut down only											61			58		
Temperature after shut down						fell	fell	64	fell	63	63					
Field-coil temperature				68	66.5	72	71	....	....	....	....					

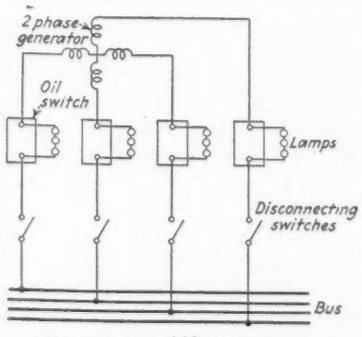
*Winding at flywheel end, temperature taken only after shutdown.

To check the temperature rating of these machines a test run was made as shown in the table accompanying. As will be seen, the maximum temperature rise was 33.5 deg. C. on the core, 28.5 deg. C. on the winding and 36.5 deg. C. on the field winding, which left no doubt as to the machines being 40-deg. machines.

EUSTACE C. SOARES,
Ophuls, Hill & McCreery, Inc., Electrical Engineer.
New York City.

Phasing Out with Lamps

ALL that is needed to phase out a 440-volt circuit are a few lamps and weatherproof sockets. Four 110-volt lamps should be connected in series in each line across the terminals of the oil switch as shown. Before the generator is started the bus voltage will cause them to burn dim. As soon as it is brought to full voltage they will act as synchronizing lamps, alternately bright and dark. If those in phase *A* are bright at the same instant as those in phase *B*, the machine has the proper direction and may be connected to the bus. If those in phase *A* are bright while those in phase *B* are dark, the direction is wrong and it will be necessary to interchange the leads of one phase, before the machine can be paralleled with other generators of the system.



PHASING OUT 440-VOLT CIRCUIT
Four lamps should be shown across each switch.

Berlin, N. H. RALPH MCKINNEY.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Running a Meeting—Electrical or Otherwise

BY KASSANDRA

SOME meetings are for the purpose of allowing the speakers to exercise their voices while the audience takes a nap. These remarks do not apply to such meetings, but only to business meetings, as of committees where action is to be taken and when the number is so small that regular rules of order are cumbersome.

There is, or should be, a chairman in charge of the meeting whose business it is to guide the discussion so that in general the committee shall accomplish the results it really wants. It is a real art to run a meeting properly, and a few suggestions may be of benefit.

We are discussing only informal, or at least semi-informal, meetings, but even in these it is very important, although not absolutely necessary, to have a list of the matters to be taken up in turn. Without such a list important things are often omitted and time is wasted by devoting too much effort to unimportant things which happen to be brought up first. When this list of order of business can be submitted to members at or before the start, it is still more advantageous.

It is important, so far as possible, to stick to the list and to discuss but one item at a time. True, there will always be members of the committee who have ideas that they must expound whether they are pertinent or not. When this happens, the chairman should try to persuade the speaker to postpone his remarks until the subject under discussion is laid aside.

Another plan which helps discussion a great deal is always to start off with some definite proposition or motion. In informal meetings today there is a custom of first having a very general discussion without any motion. This is because at first the members of the committee have not crystallized their ideas sufficiently to wish to draw up a motion. If, however, the chairman will at the start insist that there be some motion before the meeting, it helps, and he can often help by himself stating not only one but several possible motions. This will clarify the situation much better than if they carry on a discussion without any motion before them at all.

Another plan which often helps to save time and helps the members of the meeting to clarify their minds and get together is for the chairman, after perhaps one or two of the members have spoken, to poll the meeting, that is, to ask each member in turn to state briefly his ideas. Often when each member of a committee has expressed himself it turns out that the meeting is so nearly unanimous that no further discussion is needed.

Still another time-saving method is that when some proposition is laid before the meeting the chairman shall call for an informal and preliminary vote without allowing any discussion whatsoever, stating that the vote is not to be binding, but is merely to indicate how the committee feels before the matter is discussed. The chairman takes the vote, announces the figure as so many for, so many against, and then may say that in order to save time the majority will not be allowed to speak until the minority have expressed their opinions.

Unless the minority by discussion can change the opinions of some of the majority, it would only be a waste of time for the majority to talk. After the minority have expressed their opinions the chairman can ask if any of the majority have changed their minds. If none have, it is obvious that the committee is ready for a definite vote, provided that it is a subject which the members are willing to decide by a majority vote rather than to wait for unanimity. This principle, of course, cannot be carried to an excess, but in small and informal meetings it will save much time.

In a formal legislative body the speaker entertains only motions made by the members. In an informal committee meeting the chairman can usually save time and help all along the line by himself formulating the motions. If he attempts to do this so as really to express the idea of the committee he can often accomplish a great saving in time in helping the committee to get their minds together.

A Better Lighting Campaign in Milwaukee

CONSTRUCTIVE advertising for better lighting in the home is being conducted in Milwaukee by the Electrical Development Association of Wisconsin. Thirty-inch advertisements, of which two good examples

LIGHT CONTROL in the Home
ON the stage they have learned how to use light effectively, but people are just beginning to realize the possibilities of light control in the home.
If your living room, or dining room, is lighted by a single chandelier the lighting effect is always the same -and sameness grows monotonous.
The addition of a few wall brackets and portable lamps to the lighting equipment of the home makes it possible to secure a great variety of charming lighting effects, ranging from full illumination to the effect illustrated above in which the room lighting is subdued while the performer at the piano is "spot lighted" by means of a portable lamp.
The illuminating experts of the Electrical Development Association of Wisconsin will gladly assist you in improving the lighting of your home, office, store or factory. They have nothing to sell—only helpful advice to dispose of and that's free. Write, phone or call.
Electrical Development Association of Wisconsin
What are your Children's Eyes worth?
MONEY couldn't buy them, and yet so many homes this priceless treasure—good eyesight—is being slowly destroyed by improper illumination.
Don't jump to the conclusion that your light is right if it is bright. Light that is too intense is as bad for the eyes as light that is too dim. The two things to be avoided are GLARE and GLOOM.
Old-fashioned lighting fixtures are to blame for most of the improper and hurtful illumination in Milwaukee homes, offices, stores and factories. Fixtures designed eight or ten years ago are fit for nothing but the scrap heap, so great has been the improvement in electric lighting within recent years.
Give this important subject some thought. You buy new furniture for your home, new equipment for your office, store or factory, from time to time, yet you have'nt replaced your lighting fixtures in years. Isn't it about time you did so?
Electrical Development Association of Wisconsin

ADVERTISEMENTS USED IN BETTER LIGHTING CAMPAIGN

are shown here, have appeared three times a week. Other typical advertisements play up such ideas as "When the sun went down the caveman went to bed," "Lighting fixtures can make or mar a room," "How many convenience outlets have you?"

Another Reason Why More Electrical Homes Are Needed

THE constant need of home electric demonstrations is shown in the following story related by an employee of the British Columbia Electric Railway Company. He says:

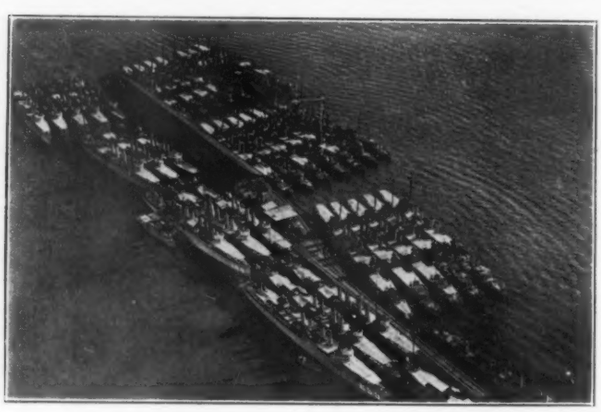
"Talking to a builder the other day, I asked him if any of his otherwise excellent houses had any baseboard outlets for electrical appliances. 'No,' he said, 'I don't bother much with those. The electrical work costs me too much. Why, in one house I built the other day the electric wiring cost me just $130.' I asked him what people would do who had standard or table lamps, as nearly everybody had. 'Shucks!' he said. 'What I would do in my case would be to bore a hole in the floor and run a wire down to the basement and connect it up there. Any one can do that. I wouldn't pay an electrician for that.' So thinks the world today. People put in the most expensive plumbing fixtures, but when it comes to electrical work they skimp and cut it to the bone."

Warships Use Central-Station Service in San Diego

BY P. P. PINE
Sales Engineer San Diego (Cal.) Consolidated Gas & Electric Company

ALTHOUGH during the last few years there has been an increasing amount and variety of load taken on by central stations from industries which formerly obtained power from their own plants, it is rather unusual even in this day for a public utility to supply warships with electricity. But in San Diego, the home port of the Pacific destroyer fleet, this service to naval vessels has come to be a considerable factor.

There are usually from thirty to sixty destroyers in the harbor of San Diego. These are grouped in "nests"



"NEST" OF DESTROYERS SERVED ELECTRICALLY

and tied along the wharf, as shown in the accompanying illustration, which was photographed from an airplane.

It was found to be very wasteful for each ship to keep its own plant in operation to supply lighting and steam. The drastic reduction in the appropriation for fuel supply makes it necessary that every opportunity be seized to economize by efficient operation, and with this end in view a contract was entered into with the San Diego Consolidated Gas & Electric Company to supply lighting service at various points along the wharf.

The connected load of a destroyer averages about 4 kw. for lighting and 15 hp. for power, but the motors, which are of the direct-current type, are not ordinarily operated when the ship is in port. The ship's plant consists of two 25-kw. turbine-driven direct-current generators.

The blacksmith and machine shops, as well as the battery-charging plant which handles the work connected with the fleet, are erected on the wharf. These are served by two motor-generator sets of 90 kw. aggregate rating. There is a total connected load of more than 100 hp. in motors in the shops. The battery-charging load is heavy as there are a great number of batteries used on the destroyers. There have been as many as 750 floating on the line at one time, although the average load is about 300. This business has a very good load factor, the power and battery charging keeping the demand steady throughout the day. The consumption is about 100,000 kw.-hr. per month.

What Other Companies Are Doing

Binghamton, N. Y.—During the month of December, 1921, the Binghamton Light, Heat & Power Company showed a net increase in meters of 154, and thirteen new power customers were added, varying in demand from 1 kw. to 250 kw. For the year ended December, 1921, the total number of contracts handled was 4,794, of which 2,275 were new contracts. During this same period 2,294 meters were set and 543 removed, indicating a net gain of 1,751. The city of Binghamton is planning extensive additions to its ornamental street-lighting zone, a large portion of which will be completed in the current year.

Sandusky, Ohio.—Facts supported by actual demonstration to prove the increase in production through the use of high-intensity illumination in industrial plants were the feature of an interesting lighting conference and demonstration held in Sandusky, Ohio, recently. The demonstration was witnessed by three audiences composed of representatives of Sandusky's industries and commercial houses. The exhibit was arranged by the Sandusky Gas & Electric Company and the Edison Lamp Works of the General Electric Company and is part of a broad educational movement in behalf of better industrial and commercial lighting.

Rutland, Vt.—The Vermont Hydro-Electric Corporation reports a marked increase in its industrial power load as a result of the resumption of operation of the slate grinding mills in its territory, which are running twenty-four hours a day, as the demand for their product at the present time is beyond the capacity of the mills.

Reading, Pa.—Since Jan. 1, 1922, the streets of the cities of Lebanon and Reading, served by the Metropolitan Edison Company, have been lighted entirely by electricity. At the beginning of this year 581 gas lamps in Reading and twenty in Lebanon were discontinued. These have been replaced with electric lamps, which will mean a considerable saving in the cities' annual lighting bills.

San Diego, Cal.—The San Diego Consolidated Gas & Electric Company has begun the publication of a house organ, which has been named the *Glow* and is being circulated among the employees and security holders of that company in order to effect closer co-operation and a better understanding.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

Export Trade a Question of Foreign Exchange and Hard Work

By Joseph McElroy 3d
Export Sales Manager Pass & Seymour, Inc.

THERE is no reason why the electrical industry of America should not export a good supply of its products during the coming year. For, speaking generally, it is not German competition, Japanese competition or any other competition that is causing the loss of export trade of America today. It is largely the question of exchange. This, of course, is a serious problem and cannot be settled by any special prescription which will bring the export trade back to life again. It will only come through strenuous work on the part of American manufacturers and the operation in full of the old law of supply and demand, and this is going to take some time to work out. Those countries which are not manufacturing countries and which have stocks of various materials, will find that their exchanges will come back nearly to normal as soon as they market these products at a price which insures a profit over the cost of production.

JOSEPH MC ELROY, 3D

There seems to be no other remedy for exchange except this. The placing of a loan, the extension of credit, the formation of international bank schemes, will all help to some extent, but they will not give the full answer to this question, which is a large one and goes right down to the bedrock of commercial trade. One country will, of course, improve faster than another, and it is better to state the truth, know the actual conditions and have the foresight and vision to look past them into the future rather than to close our eyes and delude ourselves or go to the other extreme and feel that we should quit the export trade altogether.

This is a time when American manufacturers of electrical material should put their backbone where their wishbone now is and warm their feet. Too many of the American manufacturers of electrical devices, as well as other lines of manufacturers, developed a bad case of cold feet during the year 1921 because of the slump in the manufactured exports from the United States. These manufacturers did not see during the years preceding 1921 that the abnormally successful conditions of those years could not last. No more can they see that the abnormally bad conditions of 1921 and the present time cannot last. Trade in this country has always gone more or less in waves, or, as some term it, in cycles. We are now at the bottom of the wave and therefore our vision is obscured and we cannot see the horizon, but with the beginning of 1922 I believe that we are starting to come up to the crest of the wave again, and there is little doubt but what the crest of the next wave will be higher than the last, so that we will be able to see further and have a larger business on a satisfactory basis than this country has ever had before. But instead of idly waiting for the water to carry us to the crest of the wave it is necessary for us to help ourselves.

It will be necessary for us to advertise in periodicals which will assist in securing and holding foreign trade; to keep on the job every minute of the twenty-four hours a day and to know our jobs, which means considerable study. Many of the export managers during the last four years have sat in beautiful offices and dictated more letters declining orders and explaining why they could not make delivery than they did in dictating letters to secure orders and new business. It is time for the export manager to go out and try his hardest to develop business.

Hard Work Will Restore Trade

The possibility of American manufacturers organizing small export associations to handle jointly the lines of different materials, taking advantage of the Edge law, has been discussed very thoroughly in the electrical industry, and so far no feasible plan has been worked out. Without going into details, one of the principal reasons why such a plan has not met with favor is that if under the existing conditions such a combination was formed it could not hope to make any money for probably the next two years. Furthermore, if any one proposed to organize the combination under today's existing conditions it is doubtful if he would succeed in completing his organization; that is, if he insisted that the organization be inaugurated under proper lines of good business. It is possible that a fluent talker with a large vocabulary and a very small supply of facts could go before some manufacturers with a visionary plan and secure their promise of co-operation, but if he put the plan to them along lines which would eventually insure its permanent success he would have to demand financial guarantees which would frighten them off.

The electrical industry is still young and America is the home of its development. That is, we spend more money on research work in an endeavor to create new devices than any other country on the face of the globe. Furthermore, American quality is superior to that of any other nation, and with the other aids to business that exist in this country there is no reason why we should not secure our share of the foreign trade. But this will not come floating in on the tide to us. We must make a constant and strenuous fight for it.

Some Reasons for the Excessive Cost of Distributing Electrical Supplies

BY W. I. BICKFORD
Secretary-Treasurer Iron City Electric Company, Pittsburgh, Pa

PRESENT methods of distribution of electrical material and supplies from manufacturer to consumer are uneconomical and involve excessive costs which leave very little margin of net profit in the majority of cases to the factors concerned. This condition has been caused partly by some of the manufacturers in their effort to maintain volume of business against a condition of decreased demand, and partly by distributers refusing to function as sales representatives of those manufacturers whose products they distribute. Something has got to be done to correct this situation.

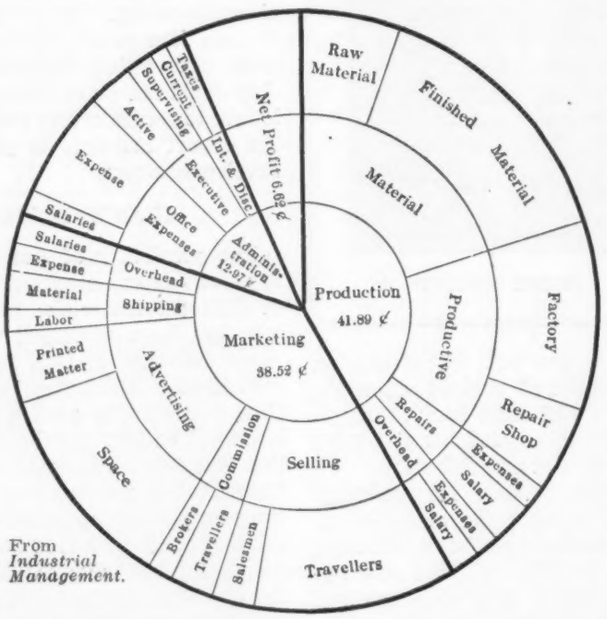
Some years ago this company made an analysis of the conditions of distribution in the electrical industry and as a result adopted a fixed policy of concentrating sales efforts on a selected number of products of manufacturers who among themselves were non-competitive. In turn we expected and received in most cases exclusive distribution for these products in our own particular territory. Thus we became a part of the sales organizations of these manufacturers and the only special sales effort we expected them to make was through our own sales organization. This arrangement provides only one middleman between the manufacturer and the dealer, making only three steps from the manufacturer to the consumer. It also obviates the necessity of the manufacturer's maintaining a local branch office. This means decreased selling expense all along the line and better net returns for distributer and dealer than when so many factors of selling expense are introduced.

I believe that many of the troubles which jobbers are encountering in the wholesaling both of large electrical appliances and some material lines is due to the fact that they are not rendering a complete and adequate service to the manufacturers in this way. If the jobber is to be the bridge between the production and the trade, he must be a bridge wide and strong enough to carry the goods all the way across. Moreover, his stock and service must have a balance that will make a going and well-grounded business that will function fully in the active creation of business.

One point that both manufacturer and distributer must bear in mind is that the margin to the distributer on different classes of material and appliances must vary with the cost of selling and handling of each commodity. In the case of a new specialty the distributer must have a margin several times that on a fixed and fast-moving article if he is expected to introduce and push its sale aggressively. Many manufacturers have overlooked this in providing for their distributers a margin which usually is no larger than that received on fast-moving items.

As soon as both manufacturer and distributer see the advantage of concentrated sales effort on lines on which the distributer receives the exclusive distribution and establishes this practice the sales expense of the manufacturer will be reduced. He will be able to give his distributer a sufficient margin to cover the expense of selling his product and leave a margin of profit for himself as well as the distributer, and the jobber himself, I believe, will find that his selling problem is not only simplified but made far more profitable.

Budget Division of a Business Dollar



From *Industrial Management*.

A GRAPHIC analysis of what becomes of the manufacturer's dollar based on a broad survey of industrial experience. The inner circle shows the main divisions and the outer circle further subdivisions in greater detail. An interesting background for comparisons in any manufacturing business.

Standardization of Dry-Cell Specifications

WITH the purpose of standardizing, so far as possible, specifications for and the sizes of commercial dry cells, the Bureau of Standards recently called a conference at which the majority of the manufacturers of such batteries, together with a large number of users, were represented. At this conference seventeen sizes of the larger dry cells were considered and seven of these were recommended as standard; thirty different sizes and kinds of flashlight batteries were considered and eight of these adopted as standard sizes, and two sizes of batteries for use with radio apparatus.

Dry batteries are used by almost every one for some purpose, either to ring a doorbell, furnish ignition for a gasoline engine, or in flashlamps and similar devices. In the latter field particularly a great variety of devices exists. Flashlamps in certain cases are regarded as novelties and are therefore made in distinctive styles in order to command a better sale. Heretofore this has meant that a large number of sizes of batteries must be used to fit the different sizes and styles of cases. There is no reason, however, why standardized batteries should not be used, the cases being made to fit them.

It is expected that the elimination of many sizes for which there is but little demand and which will no longer be considered as standard will result in a considerable saving in the cost of manufacture, and consequently in added economy and convenience to the public. When it is considered that on an average 150,000,000 dry cells are sold each year, this is a matter of considerable consequence. Beside the elimination of useless sizes, specifications were adopted for the performance of dry cells which will make for a more uniform product.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Power Factor Meeting of the V. D. E. in Essen.—MATTHIAS.—A number of valuable suggestions to overcome or at least to subdue phase displacement in large networks. For example, no oversized asynchronous motors should be used. The air gap of these motors should be kept as small as possible, preferably by using ball or roller bearings for the shaft. Squirrel-cage armatures are recommended for all motors as high as 30 hp., and to avoid excessive magnetic leakage flux there should be a speed as high as possible, if necessary with the use of a reduction gear. If a motor operates for an appreciable length of time on low load, it should be changed from delta to star connection, which can be done with a simple switch. Synchronous motors may be used for as little as 30 hp. They have a commutator and may therefore also be used as converters. A combination asynchronous-synchronous motor was developed with a high starting torque. With the use of synchronous condensers care must be exercised to determine their most effective location on the network.—*Elektrotechnische Zeitschrift*, Dec. 29, 1921.

Ball Bearings for Electrical Machinery.—H. A. ALLEN.—Ball bearings are discussed as used in direct-current motors, induction motors, machine-tool motors, portable tools, car-lighting generators and locomotive headlight generators. Curves showing motor characteristics with and without ball bearings are shown.—*Railway Electrical Engineer*, January, 1922.

How to Wind Fractional-Horsepower Direct-Current Motors.—A. C. ROE.—The author explains step by step just what to do from the start to the finish of the winding job, together with recommendations for adequate insulation under different operating conditions. The winder must know what data to take from the old winding, how to insulate the slots, what wire to use, how to put the coils in place and how to connect them. In this article these steps are explained for straight loop windings.—*Electrical Review and Industrial Engineer*, January, 1922.

Lamps and Lighting

The Eye as Affected by Illumination.—G. H. STICKNEY and A. L. POWELL.—A study of the various factors of illumination that affect the eye. Among these are intensity of light, distribution and diffusion, steadiness, color and glare. The problems of the bad conditions which cause ocular fatigue call for close co-operation between the illuminating engineer and the ophthalmologist.—*Bulletin L. D. 130 of the Edison Lamp Works.*

Illuminating Engineering Factors in Electric Sign Design.—C. A. ATHERTON.—A paper presented before the Illuminating Engineering Society devoted to an analysis of some of the factors that affect the attracting power and legibility of exposed-lamp electric signs. The effectiveness of an electric sign depends upon the power to gain attention, to make itself understood and to impress its message on the minds of those whose attention it has caught. Experiments were carried on by the author to determine the effectiveness of various arrangements of the different letter units.—*Transactions of I.E.S.*, Nov. 20, 1921.

Generation, Transmission and Distribution

The Question of Grounding the Neutral.—B. SZAPIRO.—The paper represents a mathematical investigation of the advantages and disadvantages of grounding the neutral of low-tension three-wire systems by either a single grounding at the station or a great number of well-distributed earth connections along the entire length of the neutral conductor. A single grounding at the generating or transforming station, it is claimed, possesses a number of advantages over the second method.—*Elektrotechnik und Maschinenbau*, Dec. 18, 1921.

Steel-Aluminum Conductors for Overhead Lines.—G. HILLER.—It is shown that properly dimensioned steel-aluminum conductors—that is, a stranded steel cable surrounded by one or more layers of aluminum wires—are mechanically superior and electrically equal to copper conductors, a fact which was recoginzed some time ago in America but was doubted in Germany. It is essential to use very pure aluminum, not less than 90 per cent, as otherwise heavy oxidizing will take place. The strength of the aluminum cable should be at least 85 or 90 per cent of the strength of the individual strands. The chief objections raised against a composition steel and aluminum cable were the electrolytic action between the two metals and the difference in the expansion coefficients. Practical experience showed that both objections are unfounded. In an attempt to compensate for the difference in expansion the inner steel cable was equipped with a hemp core, which resulted in a bad stretching of the cable and was therefore abandoned. The friction between the steel cable and the surrounding aluminum wires is so large that a relative motion between the two is impossible. No special precaution is therefore required in spanning such a cable. Bessemer steel wires having a tensile strength of 120 kg. per square millimeter are recommended for the steel core, and a double layer of aluminum wires should be used. The ratio of steel to aluminum should be for very important trunk lines one to four, for secondary lines one to six. These ratios will give cables of equal strength with equivalent copper lines. A tabulation of standard steel-aluminum cables for twelve sizes is given.—*Elektrotechnische Zeitschrift*, Dec. 15, 1921.

Possible Economies in Large Electric Generating Stations.—EMILE RAUBER.—Report of a French commission, under the Minister of Public Works, dealing with the economies that are possible in large generating stations. The author emphasizes the advantage of replacing of small plants by large ones, thereby reducing cost of generation. He advocates increased size of

boilers, higher steam pressure and superheat, heating the feed water by "bleeding" the turbines and greater care to prevent heat losses.—*Engineer* (*London*), Dec. 30, 1921.

Traction

Gasoline-Electric Railway Sets.—L. PAHIN.—During the war the French armies used a number of gasoline-driven generating sets mounted in railway cars for the operation of their artillery and searchlamps. These sets were made for 120, 240 and 300 hp. and may be used now advantageously as portable power plants in railroad yards and similar places. The general equipment of these cars consist of one main gas engine and a directly connected 500-volt direct-current generator, one auxiliary gas engine and dynamo rated at 30 kw. (for excitation, lighting, battery charging, etc.), one small starting storage battery, one or two car-propelling motors and the necessary switching and measuring apparatus. The complete service weight of the 240-hp. portable station is 46 tons. Its gas consumption averages 20 liters per hour, and 0.6 liter of oil is needed per hour. The car can travel on its own power at a speed of 12 km. per hour.—*Revue Générale de l'Electricité*, Dec. 31, 1921.

Summary and Forecast of Heavy Electric Traction.—A résumé of the electrification of steam railroads during the past year. The projects for the coming year in the United States, France, Italy, Switzerland, Austria, Portugal, Spain, South Africa, Brazil, Chile, Argentina, Philippine Islands, Jamaica and Japan are mentioned.—*Railway Electrical Engineer*, January, 1922.

Electrochemistry and Batteries

Recent Progress in Electrical Precipitation.—EVALD ANDERSON.—A brief description of the electrical field existing in a Cottrell precipitator. The reduction in efficiency has been found to be due to back ionization on a non-conducting plate. An equation is developed for the relation between electrode size and precipitation rate.—*Chemical and Metallurgical Engineering*, Jan. 25, 1922.

Units, Measurements and Instruments

Measurement of Surface-Condenser Leakage by Electrolytic Conductivity Method.—EARL A. KEELER.—The difficulties in applying electrical methods to measuring condenser leakage are enumerated. Methods are described for overcoming them and for securing the proper measurements. Factors that affect the accuracy of the measurements made are discussed.—*Power*, Jan. 24, 1922.

Electrical Instruments for Industrial Measurements.—EZER GRIFFITHS.—A résumé of the developments of electrical instruments now used in various industries. Among the instruments described are thermo-electric pyrometers, temperature indicators of the millivoltmeter type, recording pyrometers, recording potentiometers and the various apparatus used in optical pyrometry.—*Beama*, January, 1922.

Wave Form and Amplification of Corona Discharge.—J. B. WHITEHEAD and N. INOUYE.—Discussion of the methods used for increasing the sensitivity of the corona voltmeter and for adapting the ordinary telephone receiver and standard portable instruments to indicate the first appearance of corona. The corona-discharge current is rectified and also amplified by means of hot cathode tubes. The experiments on rectification include a study of the wave form of the discharge due to the alternating corona. It was found that the sound due to the corona could be amplified so that the first appearance of corona would be indicated on a loud-speaking telephone.—*Journal of the A. I. E. E.*, January, 1922.

Telegraphy, Telephony and Signals

Obviating Difficulties in Use of Strowger Automatic Exchanges.—C. MCHENRY.—Under present conditions in Strowger exchanges the caller has no indication whether a trunk line is available or not and consequently after removing the receiver proceeds to dial the number required. If all trunk lines are busy a caller is still in the same position as when the receiver was removed, but if congestion disappears while he is dialing, the call will be mutilated and actually lost so far as the caller is concerned. Methods are described for preventing this by insuring a dialing tone which will immediately on the removal of the receiver indicate if all trunk lines are busy.—*Post Office Electrical Engineer Journal (London)*, January, 1922.

Modulation Control of Radio Telephony.—HIDETSUGU YAGI.—The modulation systems of telephony may be classified into five kinds according to the following fundamental principles: (1) Resistance control, or the method of control by the microphone resistance in the aërial circuit; (2) detuning control, or the method of varying the frequency of the carrier wave by changing the inductance or the capacity; (3) absorption control, or the method with an inductively coupled absorption circuit; (4) grid potential control, or the method of varying the normal grid potential by means of a microphone; (5) plate potential control, or the method of varying the plate voltage microphonically. The author carried on experiments based on each of the five principles, the results of which are given.—*Technology Reports of Tohoku Imperial University*, Vol. 2, No. 3.

Miscellaneous

Welding Manganese Steel.—H. R. PENNINGTON.—Electric welding on frogs and crossing layouts of steam and electric roads is described. A table shows the effect of varying quantities of manganese and carbon on the physical quality of the product welded when cooled in air, oil and water. Data are given on the electrode material, polarity when using direct current, arc manipulation, water toughening, welding procedure and finishing be means of grinding.—*Welding Engineer*, December, 1921.

Properties and Characteristics of Insulating Materials.—R. T. FLEMING.—A study of insulating material, the subject being divided into four parts. Part 1 deals with the manufacture and properties of porcelain and describes the various processes in common use and their application to transmission and terminal insulators. Part 2 deals with mica insulation, the physical properties of mica, its use in its natural form as an insulator, and the various fabricated insulators in which it plays an important part. Part 3 treats fibrous insulation, including papers and cloths and various insulators made from these materials as a base. Part 4 deals with liquid insulation, including transformer and switch oils and varnishes employed in impregnation and dipping processes in connection with coils, etc., used in electrical apparatus.—*Journal of the British Institution of Electrical Engineers*, December, 1921.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Contractors to Take Up Proposed Amendments to Constitution

THE proposed amendments to the constitution and bylaws will probably be the most important topic to come up before the annual meeting of the national executive committee of the National Association of Electrical Contractors and Dealers, to be held at headquarters in New York City March 13 and 14. For the most part the changes proposed would enable the national association to get into direct contact with members rather than having to work through local organizations.

Considerable interest is expected to be shown in the reports of the code committee and of the cost data committee. The latter committee is proposing that the association publish a manual on estimating.

President J. R. Strong and Secretary Farquson Johnson are meeting with local members in Cincinnati, March 6 and 7, to make preliminary arrangements for the annual convention to be held in that city during the week of Oct. 9.

Ohio Report Avoids Detailed Rules on Inductive Interference

THERE was presented to the Ohio Public Utilities Commission on Monday the formal report of the general committee representing the railways, communication and power interests covering rules governing crossings of signal and power lines over steam and electric railways, and of crossings of signal and power lines over each other, as well as conflicting construction of all kinds, joint use and inductive interference. The construction rules covering crossing conflicts and joint use follow fundamentally the provisions of the National Electrical Safety Code, the method of presentation being the principal change. Each class of crossings and the rules for conflicts and joint use and inductive interference are covered in separate sections, each being complete in itself.

The inductive-interference rules are a departure from any that have been presented heretofore in that detailed rules are avoided. It was not felt that the time was ripe for the adoption of the detail requirements in that section. Co-operation through the exchange of all pertinent information on new or reconstruction work is insisted on. It was felt that remedies for interference troubles must be worked out jointly and the measures on all systems in conflict must be co-ordinated. Furthermore, due regard must be paid to the rights of later comers on highways. While a utility may build at a time when no other utilities are present on the highway in a way that public safety and its own needs seem to dictate, it does so at the risk of having to revamp its system later when other services come in. The principal of least cost, when there is more than one method of operating to prevent inductive troubles, is written into the recommended rules. The information developed by the California committee is included in the report as information, but is distinctly noted as not mandatory. The commission has indicated its intention of giving the report the widest possible publication before the formal hearing on March 2 and 3. It must promulgate the rules early in March.

Bill to Limit Jurisdiction of Federal Courts Over Commission Decisions

A BILL whose purport is to limit the jurisdiction of district and circuit courts in certain cases has been introduced by Congressman Bacharach of New Jersey and is now in the hands of the committee on the judiciary.

In it it is stipulated that "no district or circuit court of the United States or judge thereof shall have jurisdiction to entertain any bill of complaint to suspend or restrain the enforcement, operation or execution of any order made by an administrative board or commission in any state, acting under and pursuant to the statutes of such state, where such order was made after hearing upon notice, nor to entertain jurisdiction of any bill of complaint to suspend or restrain the enforcement, operation or execution of the statute under which such order was made in any case where under the statutes of that state provision is made for a judicial review of such order upon the law and the facts."

The bill has the backing of the Public Service Commission of New Jersey, which has circulated it widely and seeks to have the measure enacted into law. It is said that the Governor of New Jersey also indorses the measure and intends to write the governors of other states requesting their co-operation in the matter.

To Study Basic Causes of Non-Employment

THE fundamentals of non-employment and control of the business cycle are to be the subjects of a thorough investigation by a special committee of the President's Conference on Unemployment recently selected. Owen D. Young, vice-president General Electric Company, New York, was named as chairman. The other members of the committee are Joseph H. Defrees, president United States Chamber of Commerce; Clarence Mott Woolley, president American Radiator Company, New York; Matthew Woll, vice-president American Federation of Labor, and Miss Mary Van Kleeck, Russell Sage Foundation, New York. Edward Eyre Hunt, secretary of the President's Conference on Unemployment, was appointed secretary of the new committee, and Wesley C. Mitchell of New York field director of the study.

The committee is to report to the President's Conference on Unemployment and the public in about six months.

Indiana Considering Overhead Construction Rules

THE subject of construction rules to cover all overhead construction work and to include inductive interference is under consideration in Indiana. Some informal discussions with various interested parties have been held, and it is reported that a formal meeting will be called some time in March at which plans will be made for the formation of a committee composed of representatives of all the interests involved.

Oklahoma Commission to Establish Electric Service Rules

RECORDS of service interruptions, complaints, meter locations, meter reading and bill forms, as well as meter accuracy, voltage regulation, frequency of current supply and grounding of secondaries, will all be covered in rules that will be discussed at a hearing called by the Oklahoma Corporation Commission for March 20, 1922, at Oklahoma City. Consumers' deposits, extension of lines and the filing of maps and rate schedules will also be considered in the rules.

New City Line-Extension Rules for Oregon

A NEW set of rules, effective March 1, governing the financing and constructing of service line extensions in cities by all Oregon electric utilities has just been issued by the Oregon Public Service Commission. The utility shall bear all expense involving not more than one pole and one span of wire per customer. Where more is required the utility shall spend not less than $60 per new customer. The utility shall finance the construction above the free limit, but may collect in advance "an amount which will produce, in the form of an annuity, a sum sufficient to provide the carrying charges upon the additional investment during the development period." The mean effective development period is given as five years. During the first three years new customers on these lines must pay their pro rata share to existing customers.

All poles, wires, transformers, meters and other equipment furnished and installed by the utility remain its property.

Newton Muncipal Plant Sold to Utility Company

THE Iowa Southern Utilities Company of Davenport has purchased the Newton (Iowa) municipal electric plant. Considerable significance attaches to the purchase because for many years the Newton plant has been cited by the advocates of municipal ownership and operation as one of the most successful instances in the United States. Last year, however, a year in which utilities generally were flourishing, the Newton municipal company went bankrupt. A special election was held to validate the sale of the property, and the proposal was carried by a three-to-one vote.

A new distribution system has been installed, a new station erected, power is obtained from Des Moines through the construction of a new transmission line, and the old power plant has been abandoned and turned into a fire house. The operating personnel, it was announced, will be continued as before.

The purchase will increase the income of the Iowa Southern Utilities Company to approximately $1,000,000 gross annually. The company now operates utility plants in thirty-two towns.

Coal Miners and Railroad Men Form Alliance

AN ALLIANCE was agreed upon on Tuesday at a meeting in Chicago between representatives of the sixteen railroad brotherhoods and the United Mine Workers of America under the terms of which the coal miners and railroad men will co-operate "to more effectively protect union workers in wage struggles." The agreement will not become effective, however, until it has been ratified by each of the separate organizations.

There is no indication that the rail workers will be asked to go out in a sympathetic strike with the coal miners on April 1. The most that is called for at the present time is support. Should that support take the form of refusal to haul non-union mined coal or of hindering the movement of coal from pools or other large stocks, it will undoubtedly be of great benefit to the miners' cause.

The coal miners have asked the operators to meet them at Cleveland next Thursday to arrange details for negotiating a new wage scale. At the time of going to press the operators of the southern Ohio soft-coal mines had declined to send representatives.

California Commission Replies to Criticism by Governor Stephens

FUNDAMENTALLY the issue of regulation is far more important than the particular decision rendered in any special case, the members of the California Railroad Commission assert in reply to a criticism of their actions made by Governor Stephens and reported in last week's issue. In his letter the Governor said that the increased rates granted certain utilities were not in keeping with general conditions, and he urged the commission to reopen the case.

"Far exceeding in importance any question involved in these particular cases," the reply says, "is the fundamental issue of regulation as established by the people of this state. The success of this system depends upon public confidence and understanding. But it equally depends on full freedom under the law to do exact justice, uninfluenced by any other considerations whatsoever. We share with you a measure of anxiety for the future of regulation, but we have an abiding faith in the ultimate good common sense of the people when the real truth is known to them. Regulatory bodies should not be swerved from doing justice because of public criticism any more than they should be misled by the selfish claims presented by corporations. While regulation may be weakened by the temporary or local unpopularity of some decisions, it would be destroyed by even the suspicion that decisions were affected by any consideration or influence other than the real merits involved, ascertained after full and careful consideration of all the facts.

"The commission desires public approval, but it believes the only way it can secure or retain public confidence is by being fair and just. If it must choose between being right or being temporarily popular, it must choose being right."

The commission states that no better, fairer or more equitable system than that of regulation as it now exists has been suggested or can be devised. It maintains that the system of regulation administered in California for ten years has been the most important single factor in the growth, development and prosperity of the state. During this period the utilities have been permitted to earn a fair return and nothing more, but that fair return has enabled them to function and provide necessary service. No greater disaster could occur to California than to weaken confidence in regulation.

In discussing the particular cases referred to by the Governor, the commission states that the cases have been re-examined in accordance with law and that there appears to be no good reason why the increased rates as approved should not be allowed to stand. Under the decisions and because of them, the commission says, the companies involved have been able to raise funds to provide improved service and this money will be spent with the utmost energy and efficiency.

In conclusion the commission observes that in all cases the commission must look beyond the mere question of present rates to that of permanent service. In an expanding state like California service can keep pace with demand only by the constant investment of new capital, but this could not be supplied by earnings except by rates which should not be and are not allowed. This outside capital cannot be had unless the companies are permitted to earn enough to pay interest on it, and adequate service cannot be rendered without it.

West Penn Power Again Expanding Generating Capacity

THE expenditure of approximately $6,000,000 has been authorized by the West Penn Power Company for the purchase of two additional 30,000-kw. units for the Windsor (W. Va.) plant. The company is also contemplating large extensions to its Springdale plant, only recently opened. There is now 30,000 kw. installed at the company's Windsor plant, 42,000 kw. at Springdale and 56,500 kw. at Connellsville. The new Windsor units will bring the company's installed capacity up to 188,500 kw. At the Windsor plant there is, besides, 90,000 kw. installed and operated by the American Gas & Electric Company. The new units will therefore bring the entire rating of this plant up to 180,000 kw.

Easton (Pa.) Plant to Be Enlarged

WORK has been started by the Pennsylvania Edison Company on an enlargement to its power plant in Easton, Pa., which will increase the rating of the plant by one-third. The total cost will be approximately $800,000. The improvements include the installation of a new 10,000-kw. steam turbine together with additional boilers.

Officials of the Pennsylvania Edison Company feel that an increase in the plant's capacity is demanded by the improved business conditions in the territory which the company serves.

Plans are under consideration looking toward the construction of transmission lines in 1922 which will connect the Easton plant with other large plants in adjacent territory, including that of the New Jersey Power & Light Company at Dover, N. J.

Oil-Burning Standby Plant for Maine Water-Power Company

CONTRACTS have been let by the Cumberland County Power & Light Company of Portland, Me., for the construction of a steam standby plant. This will be an oil-burning plant equipped with two 6,250-kva. units. The plant will be built on the unit plan so that it can be extended as conditions warrant. The actual construction work is expected to start next month and is to be completed by Nov. 1.

The construction work will be done by the Foundation Company and the engineering work by Charles O. Lenz, both of New York.

Large Development Planned on Ottawa River

ON FEB. 15 the private bills committee of the Quebec Legislature unanimously approved the bills presented in behalf of the syndicate headed by E. A. Robert, president of the Montreal Tramways and Canadian Light & Power Company, enabling the latter to acquire the National Hydro-Electric Company, which owns the power site on the Ottawa River at Carillon, Quebec, half way between Montreal and Ottawa. The bill also gives the distributing company controlled by the above syndicate, the Montreal Public Service Company, the right to sell power in twenty-three counties. It is understood that one transmission line is planned to run through Broome County to Vermont.

Mr. Robert, addressing the committee, asserted that 2,000 men would have work on the project all the year around for the next four or five years and that between $30,000,000 and $40,000,000 would be spent on construction.

Power a Vital Factor in Reconstruction, Says A.I.E.E. President

TO COMPETE with other countries in the economic struggle growing out of the war, electric power in the United States must be "on tap" everywhere, said President William McClellan of the American Institute of Electrical Engineers last week at Hartford, Conn. Addressing the Connecticut Section of the Institute, President McClellan reviewed recent efforts to make the organization of greater use to the membership and touched upon the joint conferences with committee chairmen from other associations to prevent overlapping detailed investigations of prime-mover problems.

"I think we have struck bottom industrially," the speaker said in discussing the economic situation in the United States. He pointed out the necessity for selling to a larger market in order to attain prosperity and indicated that Americans should prepare to meet European competition when it is "going strong"—a greater problem than the one presented by existing conditions of underproduction overseas. The higher scale of living in America, he said, is to be preserved and increased only by intensive work, and this involves the recognition by trades unions of the blighting effects of restriction of output, the reduction of overhead expenses, and the utilization of all the best methods of co-ordinated production under "super-management," electrified industry and rehabilitated transportation facilities.

Big Order Given for Electric Trucks for Express Service

WITH the purchase recently of 104 electric street trucks, the American Railway Express Company has still further strengthened its claim to be the largest user of electric trucks in the world. The company now has in service throughout the United States, in addition to other kinds of vehicles, more than 1,200 electric trucks. The new equipment is for service in New York, Philadelphia and Buffalo. The New York allotment comprises twenty trucks of the 5-ton size, Philadelphia is to have fifty 2-ton trucks, while the thirty-four for Buffalo are of the 2-ton and 3-ton sizes.

It is planned to use the New York trucks on a twenty-four-hour basis. This will be accomplished by means of standardized interchangeable batteries, each truck being provided with two storage batteries. Thus at the end of the first shift the exhaused battery will be removed and a freshly charged one put in its place. The battery boxes are designed for rapid changing, and special devices for battery handling have been installed at the charging stations.

Fundamental Business Conditions to Improve

ON THE whole, business and industrial activity showed further decline during both December and January, according to the "Survey of Current Business," issued by the Department of Commerce. However, there was a continued improvement in fundamental conditions, and a spirit of optimism prevailed in virtually every industry that augurs well for the future. It is believed in trade channels that as soon as the period of inventory and tax adjustment has passed there will be renewed activity, and this was already evidenced toward the end of January.

The iron and steel industry is still without definite trend, although activity in certain lines was greater during January than in December. Textiles likewise showed little change. The automobile industry showed the usual seasonal dullness during January. Both the grain and the live-stock markets showed some depression during the first week of January, but since that time there has been a gradual improvement. The purchase of corn for Russian relief has been of material aid to the corn market. Those industries which depend upon purchases from the rural population have shown little recovery, and not much is to be expected until the new crop year. This is particularly true of agricultural implements.

Meter Problem Conference at Worcester

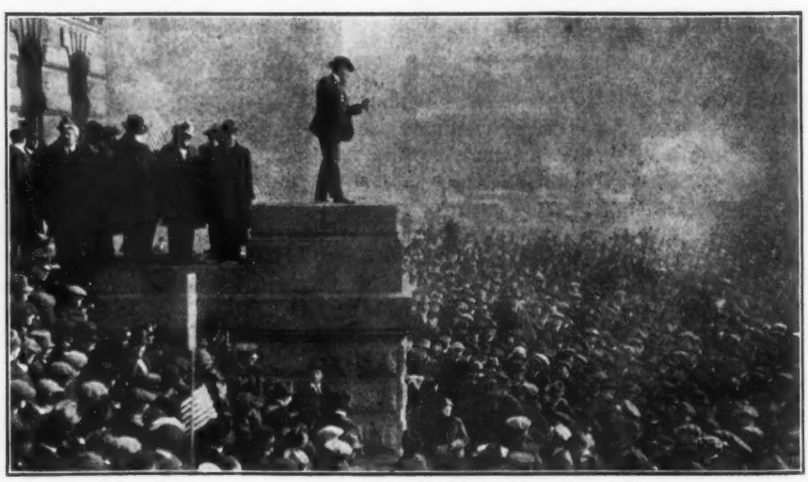
MORE than 125 central-station engineers, testing experts and manufacturers' representatives attended an all-day conference on meter problems at Worcester, Mass., Feb. 7, under the auspices of the Meter Bureau of the New England Division, N.E.L.A. Charles H. Ingalls of the Edison Electric Illuminating Company of Boston presided, and the Worcester Electric Light Company threw open its Faraday Street substation and club rooms to the gathering. A comprehensive résumé of the latest practice was given in the following talks: "Theory and Methods of Handling Indicating Instruments," by B. P. Romain, Weston Electrical Instrument Company, Newark, N. J.; "Meter and Instrument Pivots," illustrated by microscopic and other slides, by B. W. St. Clair, General Electric Company, West Lynn, Mass., and "Remote Metering and Load Dispatching," by B. H. Smith, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

No Decision Reached on Water-Power Depreciation Regulation

AN EXECUTIVE session of the Federal Power Commission was held in the office of the Secretary of War on Feb. 20. Except to state that three legal matters had been under discussion, Secretary Weeks declined to comment on what took place. It is understood that the matter of depreciation was considered, and it is thought that Secretary Wallace favors the depreciation regulation more or less in its present form, while Secretary Fall favors a more liberal form of accounting. The determining vote will be cast by Secretary Weeks. It is believed that he has not as yet made up his mind upon the merits of the conflicting contentions.

A Public Protest Against a Commission's Decision

FOLLOWING their newly elected Mayor, Lew Shank, the people of Indianapolis, like Coxey's Army, marched to the State House, on Jan. 28 in protest against a decision of the State Public Service Commission. In other cities besides Indianapolis there has been great dissatisfaction with this order of the commission, which permits the merger of a number of utilities into the Indiana Electric Corporation and the issuance of $17,496,000 of securities. Already a petition for a rehearing has been filed. The first time the application for permission to merge came before the commission it was refused because the proposed capitalization was excessive. The crowd is here shown listening to Mayor Shank denounce the order from the steps of the State House. A committee saw the Governor, but he refused to interfere.



Refilled Lamps Unacceptable to Boston Edison Company

NEW lamps are always purchased by the Edison Electric Illuminating Company of Boston and "refills" have no standing, declared L. R. Wallis, superintendent of the sales department, at the rate hearing recently before the Massachusetts Department of Public Utilities. A brief inquiry into the disposal of returned lamps was conducted by counsel for the petitioners against the company, during which the question was asked whether the Edison company had any agreement with the General Electric Company or other manufacturer regarding the use of refilled lamps. Mr. Wallis denied knowledge of any such agreement and said he was sure no agreement exists in regard to exhausted lamps. Refilled lamps, the witness declared, are not considered good, because they are not photometered, they are not accurate as to voltage, are not standard and are not considered standard by any one. The witness gave as his recollection an allowance of about 2 cents each for turned-in lamps at the factory.

Alabama Power's Muscle Shoals Offer Makes Favorable Impression

A BOMBSHELL has been cast into official and legislative circles in Washington by the offer of the Alabama Power Company to complete the Wilson Dam at Muscle Shoals without further advances or expenditures by the United States government. An important member of Congress, who cannot be quoted in advance of the speech he intends to make on the floor of the House, is authority for the statement in private conversation that the offer the Alabama Power Company has made has put Mr. Ford's offer in a completely new aspect and brought about a definite revulsion of feeling against the Ford proposals.

This sentiment is crystallizing in a number of directions. Many Southern members of Congress who have been leaning toward the Ford offer in advance of the technical and legal examination of its provisions which Congressional committees are now making are now actuated solely by their intense desire to assist in bringing about a great new industrial development of the whole South in connection with a suitable development of Muscle Shoals, from which power will be sent long distances throughout the South, and in connection with the development of the navigation resources of the Tennessee River and the waterways it leads into, including the Ohio and the Mississippi. These Southern members have been much disturbed by the apparent inability of the House military affairs committee to get from Mr. Ford's representatives any guarantee that he will continue to make fertilizer at Muscle Shoals, if the project is turned over to him, unless he can do so at a profit. They realize that while it has been continually brought out at the hearings that Mr. Ford hopes to continue to make fertilizer, it has also been continually brought out that this is merely an expectation and a hope and that there is no guarantee whatever attached to it. Another source of anxiety to those Southern members of Congress has been Secretary Weeks' repeated official statements, in his report to Congress and at the hearings, that in order to turn Muscle Shoals over to Mr. Ford and complete it for him it will be necessary for the government and the taxpayers to advance a large amount of new money, estimated by the engineers at from $45,000,000 to $50,000,000. This fact alone has been as bald and as arresting as a dash of cold water to those members of Congress, from all sections of the country, who are charged with the administration of the appropriations and with the responsibility, in these days of bonus talk, of finding sources of new revenue.

Realizing the eager desire of members of Congress to have the facts of the Alabama Power Company's offer before them, Thomas W. Martin, president of the company, has written to each member of the Senate and the House a letter inclosing a copy of the offer as he transmitted it to Secretary Weeks. In his letter to the members of Congress Mr. Martin calls attention to the fact that the Alabama Power Company is a public utility operating in a large field, that its rates and service are regulated by public authority, that it is bound to serve every one without discrimination either in service or in rates, and that natural resources belonging to the public are not diverted to private use when administered by public utilities. An analysis of both the Alabama Power Company and the Ford offers is given in skeleton form herewith:

ALABAMA POWER PROPOSAL

1. No further expenditure for the completion of Dam No. 2 (known as the Wilson Dam) except for locks, and no advances will be required on the part of the government as the power company agrees to complete Dam No. 2 at its own expense.

2. The power company will accept a fifty-year license under the federal water-power act, which provides for recapture by the government at the end of the license period.

3. The power company will buy from the government the steam station at Nitrate Plant No. 2, the government unit at the Gorgas plant and the transmission line connecting Gorgas with Muscle Shoals, and will pay the Government $5,000,000 for same.

4. The government will retain ownership and title to Nitrate Plants No. 1 and No. 2 and the Waco Quarry, which has cost more than $70,000,000, and the power company will furnish free 100,000 hp. for the operation of these plants for the manufacture by the government or others of fertilizer or munitions of war.

5. The remainder of the Muscle Shoals power will be made available to all industries of the region by means of high-tension transmission lines operated by a public service company.

6. The government is relieved of the operation and maintenance of the dam and the crest gates thereon and is required only to maintain and operate the locks.

In summary: The proposal of the Alabama Power Company not only completes the dam and power house without expense to the government; it also provides free power for nitrates for war purposes and fertilizers; it leaves the nitrate plants under the full control of the government; it harmonizes absolutely with all plans the government may have for improving navigation; it provides a cash payment the interest on which will maintain the nitrate plants in a state of preparedness; and a great natural resource is devoted to the use of the public rather than to a private enterprise.

THE FORD PROPOSAL

1. Mr. Ford's proposal requires the completion of Dams Nos. 2 and 3 at government's expense, estimated on incomplete data at about $50,000,000. Mr. Ford will have the benefit of the government financing the entire cost, whatever it may be, for one hundred years or more, at 4 per cent. No interest, however, will be paid on the cost of acquiring lands and storage rights necessary for Dam No. 3 (estimated at from $1,500,000 to $5,000,000) nor on the cost of acquiring the property of Alabama Power Company which Mr. Ford requires to be turned over to him. Mr. Ford

constructs the dams for the government. No limit to the cost of completion is provided, nor any control insured against extravagance or errors of judgment of Mr. Ford or his sub-contractors.

2. Mr. Ford proposes to form a corporation and receive a hundred-year lease of Dams Nos. 2 and 3, with renewal privilege. This is contrary to the policy heretofore fixed by the government in the water-power act, which limits rights on navigable streams to fifty years, and the acceptance of Mr. Ford's offer would be a discrimination against the many companies which are required to operate under the federal water-power act.

IMMENSE COST OF NITRATE PLANTS

3. Mr. Ford's offer provides that on payment of $5,000,000 he will receive possession, not only of the steam plants at Nitrate Plant No. 2 and Gorgas and the transmission line from Gorgas to Muscle Shoals, but also of Nitrate Plants Nos. 1 and 2 and the Waco Quarry, which have, exclusive of the steam plants and the transmission line, cost the government over $70,000,000. The Warrior plant and transmission line are on lands of the Alabama Power Company. That company has a contract that gives it the right to purchase this plant and transmission line. Mr. Ford insists that ownership of the plant and transmission line is essential to his plans. Extended litigation to dispose of the claims of the Alabama Power Company is at least possible. If the government were to lose this litigation, Mr. Ford would not be bound, and it is probable that he would not enter upon a performance of his obligation until this matter had been disposed of.

4. A similar situation exists with reference to the option on Nitrate Plant No. 2 contained in the contract of the government with the Air Nitrates Corporation.

5. While Mr. Ford pays $5,000,000 to the government for property which cost the government over $80,000,000 and which can be salvaged, in the opinion of the army engineers, for from $8,000,000 to $16,000,000, he retains the right to sell all the property so acquired, except Nitrate Plant No. 2. The army engineers are confident that Mr. Ford can reduce his investment to approximately $400,000 by the sale of property so acquired by him from the government.

6. Although the Ford proposal is assumed to insure the manufacture of fertilizer, the recent hearings before the committee of the House of Representatives make it plain that Mr. Ford does not undertake to manufacture fertilizers or any definite quantity of fertilizer compounds, or to operate at all unless in competition he can make cost plus 8 per cent.

7. There are at present two plants for the production of nitrates. Mr. Mayo, who is Mr. Ford's engineer, made it plain to the committee that one of the plants would not be operated as a nitrate plant at all, but would be converted into an auto factory. For breach of his contract Mr. Ford does not forfeit the rights which he acquires from the government, as is true in the case of companies operating under the federal water-power act, but in the opinion of the acting Judge Advocate General of the army the sole remedy of the government would be to sue Mr. Ford or his company for damages, in which case the government would have to prove, not that the farmers suffered damage from Mr. Ford's failure to produce fertilizer, but that the government itself suffered monetary damages from that default. Such damages would seem necessarily highly speculative.

FERTILIZER AGREEMENT INDEFINITE

8. In the hearings before the military affairs committee, Mr. Ford's representatives have declined to commit him to an agreement to manufacture any minimum amount of fertilizers or fertilizer compounds, and they have refused to commit him to the obligation to devote the whole or any definite part of Nitrate Plant No. 2 to the production of fertilizer. He could, accordingly, devote 10 per cent of the plant to fertilizer and 90 per cent to industrial uses, or he could devote the entire plant to the production of a substance —like lime, for instance—used in small quantities by farmers and in much larger quantities in industries, taking 8 per cent profit on the amount sold to the farmers and any profit he could get on the amount sold to industries.

9. Testimony before the military affairs committee brings out the fact that all Muscle Shoals power is to be used solely by Mr. Ford for manufacturing purposes and none of it will be available to the public in general. A great natural resource, owned by the public, would be accordingly diverted from the public use to the use of an individual whose business and profits are not under the control of the government and who is in competition with some of the people at least who bought bonds and paid taxes with which to develop the property.

10. Mr. Ford's company will pay to the United States annually the sum of $35,000 on Dam No. 2 and $20,000 on Dam No. 3 for repairs, maintenance and operation of the dams, gates and locks. The government must maintain the dams with these amounts and replace them if destroyed in 100 years or during renewal period.

11. Semi-annual sinking-fund payments of $19,868 on Dam No. 2 and $3,505 on Dam No. 3, for the purpose of retiring the cost of Dams Nos. 2 and 3 at the end of the 100-year period, are provided. No business house would accept an investment on this basis.

12. Mr. Ford's company is to maintain Nitrate Plant No. 2 in its present state of readiness for immediate operation for the production of explosives, and is to turn it over to the government on demand, together with such of its personnel as may be required for the national defense; but no provision is made in the contract for the costs to the government of taking over the plant in the event of such an emergency.

13. To determine the correct apportionment of cost, a board is provided for to be selected from persons nominated by three farm organizations, "or their successors." Farmers' organizations are notoriously transitory. No criterion is provided for determining which organizations of the future shall be the successors to the three now named.

14. This board, nominated by the farmers' organizations, has no power to control costs. The amounts paid for labor, salaries, services, power and materials are beyond the control of the board. It can only determine whether these have been correctly apportioned to the fertilizer compounds produced as compared with other products of the plant.

HUGH COOPER ATTACKS FORD OFFER

Acceptance of the Ford offer, declared Hugh L. Cooper, consulting engineer for the government on the Muscle Shoals project, before the House military affairs committee, would handicap the water-power development of the South and in this respect would be like removing the vertebræ from a man "you expected to get along." Mr. Cooper attacked the Ford offer from many angles, saying that it would be a calamity to take the greatest water power of the South from the field of public utility for a hundred years. He felt that fifty years was sufficient time for the lease to run.

Under the terms of the Ford offer it would be possible, Mr. Cooper asserted, for Mr. Ford to obtain power at Muscle Shoals at approximately half the cost per unit of energy of its development at Niagara Falls or at Keokuk, on the Mississippi, and at less than half the unit cost for the same kind of energy developed in the commercial power territory within reach of Muscle Shoals.

It was Mr. Cooper's belief, he said, that, although the people of the South were now "crying for the consummation of the Ford offer," before the lease had expired the same people would be crying for its abrogation. Personal experiences in the development of large water powers in the past thirty years led him to this belief. At Niagara Falls, for instance, he said, the power had been used for chemical purposes not unlike the plans he understood Mr. Ford had for Muscle Shoals, and yet the city of Buffalo, about 23 miles away, had been compelled to build a steam-power plant to serve its needs.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Massachusetts Company Changes Name.—The Tyngsboro Electric Light Company of East Pepperell, Mass., has changed its name and is now the Middlesex County Electric Company.

An Indiana Electric Company Dissolves. — The Browne-Mills Electric Company of North Manchester, Ind., is in the process of dissolution. The company recently sold its holding at North Manchester to the Bippus Utilities Company of Huntington, which will furnish North Manchester with electricity.

New York Contractors Report Prosperous Year in 1921.—More than $25,000,000 worth of business was transacted in the State of New York during 1921 by the 453 members of the State Association of Electrical Contractors and Dealers, according to statistics reported by the secretary, J. P. Ryan, at the annual meeting, Jan. 18 and 19. These figures represent an increase in sales of more than $3,000,000 over 1920.

Proposed Power Development on Ebro River, Spain.—An irrigation and power development on the Ebro River in Spain is being given serious consideration in the Spanish Parliament. By the construction of a dam in the headwaters of the Ebro River at Reinosa, in the Province of Santander, it is said, the development of 185,000 hp. and the irrigation of 275,000 acres of land would be made possible.

Only Cash Payments Entitled to Discount in Idaho.—According to a decision which has been rendered by the Attorney-General of Idaho, political subdivisions of the state are not entitled to the discount offered by utility corporations for prompt payment of bills when these bills are paid by warrant not convertible into cash until some future time. This ruling was made in the case of Madison County against Utah Power & Light Company.

Proposed Electric Railway in Nagano, Japan.—Application has been made to the Nagano prefectural authorities, according to *Commerce Reports*, for approval of the establishment of the Iizu Denki Kido Kaisha (Iizu Electric Railway Company), a transverse line through the southern Japan Alps, projected by persons in the cities of Tokyo and Nagoya and in Gifu and Nagano prefectures. The proposed road is to be about 42 miles long, branching from Nakatsugawa station, on the Chuo line and terminating at Iida-machi, Shimo, Inagun, Nagano prefecture. The cost is estimated at 10,000,000 yen ($4,985,000).

Proposed Municipal Electric Plant for Hermosillo, Mexico.—Plans are under consideration for the installation of an electric light plant, waterworks and other improvements in the city of Hermosillo, State of Sonora, Mexico, the expense of the projects to be borne by the Mexican federal government, according to *Commerce Reports*. The Chamber of Commerce at Hermosillo has been authorized to negotiate with contractors in regard to the installation of the proposed works.

Massachusetts Electrical Contractors Help Defeat Repeal of License Law.—A bill introduced into the Massachusetts Legislature, at the instance, it is said, of the American Federation of Labor, to repeal the statute governing the licensing and supervision of electricians has been defeated as the result largely of the strong opposition of the State Association of Electrical Contractors and Dealers. A delegation from this body appeared before the committee of the Legislature to which the bill had been referred and made clear its undesirable nature.

China to Have Immense Radio Station at Shanghai.—Negotiations between the Chinese government and the Federal Telegraph Company have been completed whereby China will have within the next two years a complete network of radio communication facilities which will include one station as large as any at present in existence. The contract covers the erection of five radio stations, the first to be built in Shanghai. This station will consist of six towers each 1,006 ft. in height. The equipment will include two 1,000-watt Federal arc sets and will operate on a single-wave system.

Oklahoma Cities Abandon Municipal Plants.—Ramona, Okla., has voted to abandon its municipal electric light plant and go back to the service obtained from the privately owned plant at Sand Springs. A survey for a high-tension transmission line is now being conducted to serve Barnsdall, Pershing, Wynona, Nelagoney and Pawhuska. The municipally owned plant at Pawhuska, upon which the community had recently voted to spend $113,000 in improvements, will also be abandoned. On Jan. 14 the voters in Locust Grove voted to spend $20,000 for constructing a transmission line connecting with the plant at Pryor.

Skating, Dairy Products and Electricity.—The *Edison Monthly* for February draws renewed attention to the penetration of electric service into almost every cranny of present-day life. How electric tractors are used in resurfacing the ice at the skating rinks of New York City is the subject of one article, and the great importance of motor drive in modern dairies, where cows are milked, cream separated and pasteurization aided by its agency, is the subject of another. The assertion is made that throughout the United States an annual gain of $200,000,000 is made because of the introduction of electricity into the dairy business.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Electric Club of Philadelphia.—This club announces the election of the following officers: President, Philip H. Ward, Jr.; vice-president, George G. Young; treasurer, August Mandel, and secretary, William S. Eaton.

American Association of Engineers.—The first "annual conference of practicing engineers," under the auspices of the A. A. E., was held on Washington's Birthday at the Congress Hotel, Chicago, with morning and afternoon sessions.

Section Meetings of the A. I. E. E.—March section meetings of the Institute announced include: Schenectady, March 3 (joint meeting with other engineering societies), discussions on heating and ventilation, including papers by Thornton Lewis, vice-president and general manager York Heating & Ventilating Corporation, Philadelphia, and F. Paul Anderson, Pittsburgh, director of experiment station of the American Society of Heating and Ventilating Engineers; Vancouver, B. C., March 3, "Storage-Battery Locomotives for Mine and Industrial Haulage," by T. H. Crosby; New York, March 15 (joint meeting with civil, mining and mechanical engineers), "The Port of New York"; Pittsburgh, March 15, A. C. Cummings, electrical superintendent of the Carnegie Steel Company, and E. R. Roberts, mechanical superintendent of a large department store, will speak at a meeting planned to bring manufacturers and users of electrical machinery and suppliers of electric power together for frank discussion; Schenectady, March 17, "Recent Developments in High-Tension Practice and High-Voltage Phenomena," by F. W. Peek, General Electric Company, Pittsfield, Mass.

Coming Meetings of Electrical and Other Technical Societies

A. I. and S. E. E. Section Meetings—Philadelphia, March 4; Cleveland, March 13; Chicago, March 15; Pittsburgh, March 18; Youngstown, March 25; Birmingham, March 25.

A. I. E. E. Section Meetings—Vancouver, March 3; Schenectady, March 3 and March 17; New York, March 15; Pittsburgh, March 15.

American Physical Society — New York, Feb. 25; Washington, April 22.

Prime Movers Committee, N. E. L. A.—Pittsburgh, Feb. 27-28.

Electrical Supply Jobbers' Association—Atlantic Division, New York, Feb. 28.

Oklahoma Utilities Association—Oklahoma City, March 14-16.

Illinois State Electric Association—Chicago, March 15-16.

Wisconsin Electrical Association—Milwaukee, March 22-24. (For program see issue of Jan. 14, page 96.)

American Electrochemical Society, Baltimore, April 27-29.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Rural Lines Donated by Consumers Excluded from Rate Base.—The value of rural electric lines donated by consumers was excluded by the Illinois Commerce Commission from the rate base of an electric utility for immediate rate-making purposes, without prejudice to the company in the future.

Relation of Ice Department to Electric Power Company.—Electricity furnished to an ice department operated by an electric power company should, according to a decision of the Illinois Commerce Commission, be metered and accounted for at regular power rates, thus placing the ice department upon the same footing as any other power consumer of the utility.

Pole Erected in Street Not Part of Line Extension.—A pole erected in a street to support service wires is not properly a part of a line extension, in the opinion of the Illinois Commerce Commission, and the cost of this pole and of a reasonable amount of service wire should be borne by an electric company rather than by a consumer who bears part of the expense of a long extension.

Service Quality as Basis for Rates.—The Michigan Public Utilities Commission has issued a ruling fixing the rates of the Lenawee County Telephone Company on the basis of quality of service rendered rather than property investment. Original cost and reproduction cost less depreciation as a rate basis were refused. W. W. Potter, commissioner in telephone matters, declared: "The test of the reasonableness of telephone rates is not that such rates yield a fixed return upon the original cost or reproduction cost less depreciation, but whether such rates yield a fair return for the service rendered."

Reproduction Costs and the War Period.—"We are of the opinion," the West Virginia Public Service Commission recently observed in permitting an increase of rates for water service, "that for the purpose of ascertaining present fair value little weight should be given to reproduction cost based upon average prices prevailing during the war period except in cases where a substantial part of the construction work was done during that period." Nor, said the commission, can market value, as such, be logically used as a basis of the ascertainment of present fair value. "The market value of the property of a public utility, as well as the market value of any other property, is ordinarily based upon an estimate of the net earnings that may be realized from the use or operation of such property. The market value of this property would be entirely dependent upon the present or prospective rate of return to the owner from the operation of the property in the conduct of its public service business. Earnings are entirely dependent upon the rates and market value upon earnings; hence it would be arguing in a circle to base fair value upon market value where rates are in question."

Franchise Value in Rate Fixing.—In determining rates for the gas service of the Georgia Railway & Power Company at Atlanta, the Georgia Railroad Commission said: "The company has contended that there should be included in its rate base large values for its franchises, the original cost of which was granted by the State Legislature, without charge. This claim we have not allowed in our estimates. These franchises, it is true, are taxable and are taxed as property, but it is also true that the taxes paid thereon are repaid to the company in the rates it charges the public. The public having granted these franchises in order that it might be served should not be required to pay a return on them as company property in addition to returning to the company in rates every dollar of taxes it pays. The public taxes the company; the company charges the tax back to the public and the public repays it in rates. It seems to us that the process should stop at this point."

Should Twenty-four-Hour Service Be Supplied in Small Communities?—In arranging a rate schedule for the Speed Electric Company to apply in the city of Poplar—a county seat with 1,200 population—the Montana Public Service Commission refused to compel twenty-four-hour service, holding that there was no reasonable assurance that it would bring in enough to repay the company for the expense involved. The commission said of such demands by consumers: "The consumers feel aggrieved because twenty-four-hour service is not furnished them. Without examining the question of whether such service is justified, balancing benefits against costs and efficient operation, electrical development has progressed so far in Montana today, with twenty-four-hour service the rule and not the exception, that communities not so served feel that they are the objects of unreasonable discrimination, or that local plant operators are unprogressive and indifferent. In many instances the benefits of twenty-four-hour service are more imagined than real, but a growing Western community is constantly making civic comparisons and when its residents cannot light their basements by electricity during the day, its housewives run washing machines, clothes irons and vacuum cleaners at will, and its business houses, particularly hotels, garages, repair shops, bakeries and meat markets, turn a switch to operate the many electric motor-driven devices from mangles to sausage grinders, hardships are alleged which would never be conceived had not electrical energy become one of the chief mainstays of social existence."

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Status of Texas Commission.—Under the state constitution and the statutes of Texas the Railroad Commission is a quasi judicial body and an arm of the government, and a communication to it in answer to a complaint filed with it was absolutely privileged and one which permitted no remedy in a civil action. This declaration of the law was made by the Texas Commission of Appeals in Aransas Harbor Terminal Railway Company vs. Taber. (235 S. W. 841.)*

Deprivation of Reasonable Returns Is Confiscation.—Declaring that the deprivation of the right to earn a reasonable return upon the full fair value of its property amounts to confiscation and that a public utility remains the owner of the entire property which it devotes to public service despite the existence of indebtedness upon it, the Supreme Court of Appeals of West Virginia suspended an order of the Public Service Commission of that state on the suit of the city of Huntington in the matter of water rates. (110 S. E. 192.)

Sample of Wire Admissible to Show Negligence.—In affirming judgment against the Michigan State Telephone Company, from which the Wayne Soap Company had recovered the sum paid by the latter's insurer because of the death of an employee of the soap company who came into contact with a broken telephone wire that had short-circuited a high-tension electric conductor, the Supreme Court of Michigan ruled that no error was committed in admitting as evidence a sample of the telephone wire cut in the vicinity of the accident, though it was not shown to be a piece of the wire which caused the death. (185 N. W. 805.)

Compensation Due Holder of Franchise to Dam Stream When Rights Are Appropriated by State.—In Waterford Electric Light, Heat & Power Company vs. State of New York, a suit to recover compensation for lands and flowage rights appropriated and destroyed by the state, the Court of Claims of New York found that a franchise to build and maintain a dam and to acquire the title of the state to the riverbed and the land under the overflow caused by the dam, having been accepted and acted upon, cannot be revoked or destroyed by appropriation without compensation; nor does the failure of the grantee to get the consent of Congress to erect the dam, it being in a river declared navigable, affect his right to compensation. (191 N. Y. S. 657.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

Rumsey W. Scott was elected president of the Chemical National Bank of New York at the annual election of officers in January. Mr. Scott has been manager of the industrial department

R. W. SCOTT

of the Chemical Bank since its establishment in 1920. This department makes careful investigations, reporting on the management, plant facilities, financial condition and such other items as show the true condition of an enterprise in which any particular borrower is engaged. Mr. Scott was born in Kentucky and was graduated from the Rose Polytechnical Institute as electrical engineer. In 1897 he came to New York City and became associated with the C. & C. Electric Company, first in the engineering department and later for several years in the sales department. He was connected with the Otis Elevator Company for seventeen years, first as its Washington representative, later as New England manager, and for the last five years in the main office in New York as assistant to the general sales manager and as manager of the government division.

R. C. Starr has recently been appointed chief engineer of the Merced (Cal.) Irrigation District project. Mr. Starr will continue as chief engineer of the San Joaquin Light & Power Corporation, with headquarters at Fresno, Cal. He achieved large success as chief construction engineer for the San Joaquin corporation in the building of its Kerckhoff power plant. Other engineering work in which he figured prominently was the construction of the Huntington Lake dam for the Southern California Edison Company and the building of the San Joaquin & Eastern Railway. As chief engineer of the Merced Irrigation District Mr. Starr will have charge of the design and construction of its twelve-million-dollar irrigation project.

Prof. Francis Hartmann has recently been elected first dean of the Day Technical School of Cooper Union, New York City. This appointment is in recognition of his long service at that institution as head of the department of physics and applied electricity.

W. G. Vincent, Jr., formerly executive engineer of the Pacific Gas & Electric Company of San Francisco, has recently been elected a vice-president of that company. He will have charge of all studies made by its engineers which pertain to the economic factors affecting its construction program, operation, valuation and rate making. Mr. Vincent was born in Louisiana in 1882 and was graduated from Tulane University in 1902 and from Cornell University in 1904. In 1905 he became assistant to the electrical engineer of the Ocean Shore Railroad of San Francisco. In 1907 and 1909 he was engaged in consulting practice with Dean C. L. Cory of the University of California, and during 1909 and 1910 he was superintendent of the power and light works of the University of California. In 1911 and 1912 he was employed by the J. G. White Company as valuation engineer, being afterward transferred to the Pacific Gas & Electric Company as valuation engineer, a position which he

W. G. VINCENT, JR.

held until his promotion to executive engineer in the latter part of 1920. Mr. Vincent has always been very active in the work of the local public utility associations.

Frank E. Chase has been appointed manager of the Lynn Gas & Electric Company, succeeding J. Frank Dubois. Mr. Chase has filled probably every position in an electric light and power generating system, having started as oiler and dynamo tender in the company of which he is now manager. Mr. Chase was born in Medford, Mass., and educated in the public schools of that city. He spent two years with the Thomson-Houston Company, studying the lighting branch of the electrical industry, and in 1892, at the close of his course with this company, he was connected for a short time with the Malden Electric Light Company. He became

F. E. CHASE

connected with the Lynn Gas & Electric Company in the spring of 1892 as oiler and dynamo tender at the electric station. Three months after taking this position he was transferred to that of stockkeeper, and from then on he held every position in the station at different times. In 1900 he moved to Danvers and in 1907 became interested in local politics, causing an investigation of the municipal electric light plant. He was subsequently elected Utility Commissioner and served in this office for six years, assisting in putting the municipal plant on a paying basis. During this period he also assisted in the appraisals of the electric stations at Fitchburg, Lexington and Holyoke. In 1908 Mr. Chase was appointed superintendent of the generating station of the Lynn Gas & Electric Company, holding that position until the recent retirement of Mr. Dubois, which resulted in the appointment of Mr. Chase to the managership of the company, as already stated.

D. W. Blakeslee, electrical engineer with the Jones & Laughlin Steel Company, Pittsburgh, has received a six months leave of absence from that company in order that he may take up work as an instructor in electrical engineering at Yale University. Prior to the war Mr. Blakeslee was instructor in electrical engineering at the University of Arkansas, and later he was assistant professor of electrical engineering in the same university.

L. C. Steger has been appointed director of purchases and stores of S. F. Bowser & Company, Inc., Fort Wayne, Ind.

L. A. de Marrais has been placed in charge of sales of Ohio electric cranes and locomotive cranes of the Bedford Foundry & Machine Company for J. N. Kinney, 30 Church Street, New York.

L. W. Marso has been placed in charge of the Pittsburgh office of the Hardinge Company of New York. Mr. Marso was formerly with the Quigley Furnace Specialties Company.

E. E. Creed has been assigned to the San Francisco office of the Gilbert & Barker Manufacturing Company and will have charge of the Western territory, including the Pacific Coast retail sales division.

William W. Davies has been made general manager of the recently formed Davies Glass & Manufacturing Company, Martin's Ferry, Ohio. Mr. Davies has been connected with the design and manufacture of lighting glassware for the past twenty years. He was formerly operating manager of the Haskins Glass Company and for two years operated the Cumberland plant belonging to the Wellington Glass Company.

W. H. Patterson, who has been associated with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for the past sixteen years, has resigned to become vice-president of the Kaestner & Hecht Company, electric elevator builders, Chicago. Mr. Patterson was graduated from the electrical engineering course of Purdue University in 1905.

W. H. PATTERSON

He has been prominently identified for a number of years with the development of motors and control apparatus for application to cranes, compressors, elevators, hoists and machine tools. Mr. Patterson is a member of the American Institute of Electrical Engineers, the American Society of Heating and Ventilating Engineers and several other technical associations.

Obituary

William J. Barker, vice-president and general manager of the Denver Gas & Electric Company, died on Feb. 15, of pneumonia, after an illness of only one day. Mr. Barker had been a leader in the electrical and commercial development of the Intermountain region for nearly half a century. He was a strong advocate of good-will publicity, and during his forty years as an executive of the Denver Gas & Electric Company built up an organization known throughout the West for its courtesy and service to customers. Mr. Barker, who was born in London, England, Dec. 31, 1855, came to this country as a young man with considerable technical education and soon established himself in the electrical industry with the Brush Electric Company of Cleveland. He was sent to Denver by this company in 1880 to install a system of arc lights for the Colorado Electric Company, this system being said to have been the third of its kind in the United States. The Colorado Electric Company was so favorably impressed with Mr. Barker's ability that he was engaged as chief engineer of the new system and later was advanced to the position of superintendent. After the reorganization of the company as the Denver Gas & Electric Company Mr. Barker was elected second vice-president and general superintendent and in 1913 was elected first vice-president and general manager. During his forty years service with the company he saw the city of Denver grow from a population of 40,000 to 256,000 and his company develop from an isolated concern to a twelve-million-dollar corporation controlling the gas, steam, electric light and power of the community. Mr. Barker naturally entered into the civic activities of the city in a big, constructive way and was always ready to work for the advancement of Denver.

W. J. BARKER

Charles Luther Olds, one of the founders of the Jenny Electric Company, Fort Wayne, Ind., the predecessor of the Fort Wayne works of the General Electric Company, and one of the best-known residents of the city, died recently at his home as the result of a stroke of paralysis suffered last June. He was sixty-six years of age. Mr. Olds was one of the two original promoters of the Jenny Electric Company, and the organization meetings of that firm were held in his office, which was where the plant of the Fort Wayne Foundry & Machine Company now stands. He was actively interested in the Jenny Electric Company as long as it existed and was prominent in it at the time of its reorganization, when it became known as the Fort Wayne Electrical Works. Although actively engaged in business of his own, he took an active part in the management of the electric corporation up to the time it was taken over by the General Electric Company a number of years ago.

J. J. Hemler, one of the oldest executives in point of service of the Sprague Electric Works, died on Dec. 31 last. At the time of his death he held the position of works accountant. Mr. Hemler was born in Albany, N. Y., in 1856 and spent his early years there. From early in 1885 to October, 1887, much of his time was spent in Central and South America and Mexico, where he was engaged in railroad construction and in work on the Panama Canal, which the French company headed by Count de Lesseps was at that time endeavoring to build. In 1887 he went to Cleveland, where he became connected with the Brush Electric Company, leaving there in 1896 to go to the Lynn (Mass.) works of the General Electric Company. He went to the Watsessing plant of the Sprague Electric Company at Bloomfield, N. J., in 1898, taking charge of the cost keeping. Mr. Hemler was a member of the Quarter Century Club of the General Electric Company and was much interested in all other interplant activities connected with that company.

J. J. HEMLER

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Hand-to-Mouth Buying Persists, Say Outlet Box Manufacturers

ELECTRICAL jobbers are still buying outlet boxes and other wiring supplies in a hand-to-mouth way, according to several manufacturers of these specialties interviewed lately, and sales are reported to be from 10 per cent to 30 per cent under those of six months ago. Orders continue to be placed spasmodically, and the largest percentage of orders placed call for small lots. This is probably caused by sudden increases in building construction at various times when milder weather permits.

Those manufacturers who make boxes mainly for residential construction are finding a fairly good demand and expect this to continue for at least the next eight months. The basis for this hope can be found in the volume of home building as compared with the totals for all classes of building. In January the percentage of homes to the total was 45, while residences built during 1921 formed only 37 per cent of all building. Under these circumstances the producers of this class of wiring material can afford to sit back and wait until the jobber is forced to do real buying. Industrial wiring material prospects, as was pointed out last week, are not quite as promising.

The market has been more or less unstable for several months, and it is doubtful whether a permanent price level has been reached yet. As one manufacturer expressed himself, "some of the low prices being quoted today are due to the fact that certain manufacturers were overstocked with raw material and were forced to liquidate to keep in business. A readjustment of that matter is merely a question of time, and then these low prices will once more rise above the production cost."

Good Prospects on Pacific Coast for Switchgear

THE outlook for sales of switchgear, including oil switches, high-tension fuses and line switches, is particularly favorable, according to the views of a representative manufacturer expressed to the ELECTRICAL WORLD. All the large power companies of California are planning heavy expenditures on transmission and distribution lines, most of this construction to start early this spring. There undoubtedly will be a good deal of construction in other parts of the country, but this California development work is expected to be the largest to be undertaken this year and to make heavy demands upon switchgear and line-material manufacturers all over the country.

Current sales there even now are reported to compare very favorably with those of six months ago. Much of the apparatus is of special manufacture and is not so indicative of sales movement as standard apparatus would be. However, manufacturers have obtained some good orders lately.

Under circumstances of more active demand the main trouble experienced by producers was inability to increase deliveries on raw materials. This is at an end now and materials can be obtained promptly so that delivery of the finished apparatus is limited to the time required for manufacture. One concern has become overloaded with raw material ordered on the assumption that several months would elapse before it could be shipped.

It is likely, manufacturers state, that prices will remain approximately at the present level for some months to come. Labor cost and porcelain prices are large factors in the list cost of the finished apparatus. Wages can only be deflated very gradually if controversy is to be avoided. A reduction in porcelain, and particularly in freight rates, before the spring construction starts would be of great aid to the jobbers and manufacturers whose territory takes in the Pacific Coast.

German Lamp Bulb Prices Remarkably Low

THE excellence of German and Austrian glass lamp bulbs was generally recognized in this country and in England, where before the war large quantities were imported. Hostilities put an end to this and each country had to manufacture bulbs for itself. Naturally an inferior glass product was made at first, owing to the inexperience and lack of proper ingredients, but this handicap was soon overcome so that today in both England and the United States glass bulbs claimed to be as good as those formerly obtained from Germany and Austria are available in enormous quantities. Having made ourselves independent of foreign manufacturers for glass lamp bulbs, the trend of development abroad, particularly with reference to glass-bulb prices, has not concerned us much. The testimony recently taken in England, however, reveals the remarkably low cost of Austrian and German lamp bulbs as compared with the British product.

It has always been possible to purchase German bulbs more cheaply than English bulbs. Before the war the relative prices of similar bulbs were: English bulbs, 53 shillings per 1,000; foreign bulbs delivered at London, 44 shillings per 1,000, less breakage allowance and export rebate, making it 36 shillings 6 pence per thousand. Since the war this discrepancy in price in England has increased. The present price of German glass bulb No. .0362 is 46 shillings 6 pence, plus 9 shillings 10 pence freight, or 56 shillings 4 pence delivered, as against the British total cost of manufacture of approximately 135 shillings, of which 63 shillings 11 pence, or 48 per cent, is represented by labor and the balance by fuel, materials and overhead charges. In other words, German glass bulbs can be delivered in London for less than the price of the labor for manufacturing the English glass bulbs.

On complaint of the British Flint Glass Manufacturing Association and the British Flint Glass Makers' Society, a hearing was held before the committee appointed under part two of the safeguarding of industries act on the detrimental effect upon British industry of imported glass bulbs and on the imposition of a tax of 33⅓ per cent upon imported goods. Mr. Wilson, director of the General Electric Company, which has facilities for turning out 600,000 glass lamp bulbs a week, said that since the war the British price had increased 150 per cent and that of the foreign glass bulbs 50 per cent, owing to the greater costs of material and labor. The witness said that during the last six months he had placed an order in Germany for a million bulbs and a similar order in Holland. Three reasons were given for this action: (1) The coal strike; (2) a desire to test the quality of the foreign glass lamp bulbs; (3) to bring home to the British workman the nature of foreign competition. The intimation was made that a 33⅓ per cent tax, while it would be of very great help, would be of little assistance unless British works

put in modern furnaces and become more efficient. Mr. Wilson, in reply to a question, said that his company had always lost money on its glass works and that the Germans' ability to turn out glass bulbs cheaper was due in a large measure to the greater technical knowledge of the German industry and to the better training of the German workman. The equipment of German factories was in most cases better than that of the average British factory, but even so Mr. Wilson felt that if the exchange were normal his company could compete. More recent quotations cited by Mr. Wilson for glass lamp bulbs were 53 shillings 8 pence per 1,000 for those of German make, while the Dutch, for a much inferior article, were asking 115 shillings 1.5 pence per 1,000. The average price of American lamp bulbs of sizes most generally in use is approximately $30 per 1,000 at the present time.

British Show Interest in Electrical Apartments

SOME of the most prominent English architects are showing considerable interest in the American plan of fitting apartments with complete electrical equipment, according to a report to the Department of Commerce made by United States Consul Coulter at London. As explained by one architect, it is realized that every household labor-saving device found to be of practical use must be installed to save expense of servants and to give maximum comfort at minimum expense. The standard equipment furnished would consist of electric range, clotheswasher, dishwashing machine, telephone, and convenience outlets for vacuum cleaner, toaster, iron, percolator and electrical toilet devices. These apartments, in spite of the fact that there is a large housing shortage in urban England, will probably not be built in large numbers immediately because of the expense. The attitude, however, shows a greater interest in electrical household devices and is encouraging to the American manufacturers of these products.

Demand for Wiring Devices Improving

THOUGH nothing spectacular in the way of betterment in the demand for wiring devices is evident at present, New England manufacturing plants are more than holding their own in this branch of electrical production. Several establishments are now running almost full time as a regular policy; orders are coming into factory sales offices at a somewhat better rate than was the case a few weeks ago, and February business has on the whole totaled larger than was anticipated. One large house in New England is now operating at about 70 per cent of its normal capacity. Some readjustments in employee distribution are going on, but by and large no further reductions in personnel have occurred on any material scale since the cuts made necessary by the December slump in demand. On the whole there is a decided upward trend in wiring-device sales, and this is expected to improve as the winter's end draws near. It is still too early for any sporadic or broader increase in building operations to affect the sale of wiring devices materially from present stocks or early completed outputs.

Raw material is exceedingly plentiful now, and the efficiency of labor is being maintained at better levels than was the case in many establishments during the war. Several manufacturers expressed the wish to a representative of the ELECTRICAL WORLD last week that conditions in the jobbing field might become more satisfactory. Hand-to-mouth purchasing continues in many localities. The jobber's resale price, notably on pull sockets, is held by some manufacturers to be unduly low, although it is recognized that sharp competition for the modern volume of business offered is a factor in this situation. One well-informed sales representative said that the importance of distributing through jobbers performing a complete service is in need of wider appreciation. Last summer a good deal of production for factory stock was undertaken, but at present the output in representative plants is just about even with the demand. A very modest improvement in foreign trade can be seen in wiring devices, although the gain is sufficient to justify any throwing up of hats. There is a widely held opinion that domestic business in wiring devices is bound to improve still more as the year advances, not only in connection with the wiring of buildings on a somewhat more extensive scale than last year, but through the development of a more active electrical appliance business all over the United States. As one sales manager put it, "Business can be had by going after it," in this line as well as in not a few others.

Metal Market Situation

VERY little copper is being purchased and prices continue weak, with sales by second-hands reported at 12¾ cents delivered. It is not believed that any purchaser is willing to go below 13 cents on domestic deliveries or 12¾ cents alongside ship. The opinion is held in the English market that little buying may be expected of Europe until France adopts a different attitude on a number of points. Domestic buying is held up, it seems, owing partly to starting up of mines, but largely to tariff uncertainty and bonus legislation.

Brass companies are obtaining fairly good orders, but the keenest competition exists for whatever business is offered. Brass founders seem still to be meeting their orders by scrap melting and use of virgin metal bought several months ago in excess of their booking needs. An officer of one of the largest valve companies reports that his jobbers are so low in their stocks that they fill orders from his branch warehouses. He stated that his own stock of finished valves is far below its usual size as his plant is working on a four-day week basis only.

In the face of this dullness, it is believed in several quarters that copper prices are scraping bottom and will go no lower. It is a saying that there is always either a "feast or a famine" for the copper producer; last August saw the beginning of a sales "feast" that lasted until December and as suddenly was transformed to the "famine." The market is one of sudden reactions, and it seems that one is due now and once the market halts its downward march sales will undoubtedly pick up. Deliveries during February on contracts placed last quarter were at a rate of 70,000,000 lb.

The porphyry mines, it appears, have decided not to rush into production again even though a number of other producers have taken this step. With the American Brass Company as an outlet Anaconda may break even under present prices, but it is difficult to see how some of the smaller producers can operate successfully at 13¼ cents per pound.

The lead market is firm but otherwise shows little of new interest. The steady demand maintains a good statistical position with no necessity of price cutting to obtain business. Some producers are tentatively marking up on new inquiries with the encouragement offered by liberal bookings over the last six weeks. The New York price is strongly held at 4.70 cents.

NEW YORK METAL MARKET PRICES

	Feb. 14, 1922	Feb. 21, 1922
Copper:	£ s. d.	£ s. d.
London, standard spot	60 2 6	58 0 0
	Cents per Pound	Cents per Pound
Prime Lake	13.25–13.37½	13.00
Electrolytic	12.87½–13.00	12.75
Casting	12.62½	12.50
Wire, base	14.50–14.75	14.25–14.50
Lead, Am. S. & R. price	4.70	4.70
Antimony	4.40	4.35
Nickel, ingot	41.00	41.00
Sheet zinc, f.o.b. smelter	8.00	8.00
Zinc, spot	4.85	4.87½
Tin, straits	30.37½	29.25
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	10.00–10.50	10.00–11.00
Brass, heavy	4.75– 5.00	4.75– 5.00
Brass, light	4.25– 4.50	4.25– 4.50
Lead, heavy	3.50– 3.75	3.50– 3.75
Zinc, old scrap	2.00– 2.12½	2.00– 2.12½

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

THERE has been little increase in volume during the past week, and with the exception of some wavering on wire and flexible armored conductor, prices have been steady. A note of confidence has just been sounded by a Chicago bank which on Feb. 7 placed an order for all the lighting equipment for its new building, deliveries to be in one year at present prices.

The whole trade is waiting in a rather breathless manner for the opening of the construction season, which should take place in six weeks or so. It is a certainty that there will be plenty of home building and central-station extensions, but the outlook for industrial and commercial building does not seem so brilliant. Heavy demand for radio apparatus is reported from all centers, and deliveries, long a month ago, are now uncertain. Chicago observes a more active call for parts than for complete sets. Boston reports a better tone in the motor market, with withdrawals from factory stocks helping the situation, and lamp sales there have been surprisingly good. Local interests in Atlanta are preparing to launch a home-building campaign there to relieve unemployment, which should mean good orders for wiring materials. Appliance sales are reported good in most sections of the country though the small, less-expensive types continue to lead in demand. In New York washers and cleaners have sold well, though electric flatirons show the only approach to normal. Boston notes some improvement in the higher-priced lines but in Atlanta inclement weather has cut down retail sales. Sales of ranges, washing machines, vacuum cleaners and some heating devices have been good, with sewing machines still failing to show activity.

On the Pacific Coast sales of all household appliances remain quiet.

NEW YORK

Little or no change was noted in conditions in the electrical trade this week. Jobbers report that the volume of sales continues at about the same level and that there are no lines showing unusual activity. This condition, however, is attributed to the usual dull period which is expected at this season of the year. Much confidence is expressed in the probable revival of building activity this spring, which will bring a quickening of business in electrical lines. This is looked for within the next six weeks. Building is already on the increase in the outlying districts as indicated by the greater number of orders from small contractors in these sections. While this has not yet materially affected the total sales it may well be interpreted as a forerunner of the better times just around the corner. A great deal of it undoubtedly is residence building and not the industrial type for which supply houses are earnestly hoping, but even so it keeps sales of wiring materials up to a fairly steady proportion.

Prices remain virtually unchanged. A slight weakness in the quotations on rubber-covered wire was offset by stiffening in the price on flexible armored conductor. In some quarters price concessions have been made to move stocks. This does not appear to be general through the whole line of supplies but seems to be confined mostly to certain items of schedule material. Jobbers' stocks are good, but a sudden revival of demand would soon deplete them.

Rigid Conduit.—Demand is moderate and no large orders are being placed. Jobbers' stocks are ample in nearly all sizes. Quotations this week were as follows: For ½-in. black pipe in 2,500-ft. lots, $44 to $45; ¾-in., $57 to $58, and 1-in. $82 to $83 per 1,000 ft. Galvanized pipe in the same sizes and quantity was quoted at $49 to $50, $64 to $66 and $91 to $93 per 1,000 ft.

Rubber-Covered Wire.—A slight softening of prices on wire was reported but just what caused this no one seemed to know as the general opinion is that quotations on copper would not go lower. No. 14 rubber-covered is quoted at $6.25 and $6.30 per 1,000 ft. in 5,000-ft. lots.

Flexible Armored Conductor.—This material is moving fairly well, the demand coming from contractors in the outlying and residential sections. No change in price was reported although there is less inclination to shade quotations to move stocks. No. 14, two-wire, single-strip, was quoted from $43 to $45 per 1,000 ft. and double-strip from $45 to $47 in that quantity. Stocks are ample and shipments from manufacturers are coming through promptly.

Sockets.—Pull-chain sockets in standard package lots are quoted at 33 cents, although it is reported that this price has been shaded to move stocks. Price concessions to obtain orders are not unusual.

Loom.—This material is moving a little better as there apparently has been a moderate resumption of building activity in outlying districts. The 3/32-in. size is quoted at $14.85 per 1,000 ft. and the ½-in. size at $16.20 per 1,000 ft. in 5,000-ft. lots.

Heating Appliances.—Sales of heating devices are sluggish and jobbers state that with the exception of flatirons and toasters the demand is very light. Stocks are good.

Washers and Cleaners.—There is a fair demand for these devices because of the general intensive sales effort that is being made.

Radio Apparatus.—Announcement of additional broadcasting service soon to be started in the East has intensified the demand for radio equipment. Jobbers so far have been unable to obtain any great amount of material from manufacturers and such equipment as comes through usually has been sold far in advance.

CHICAGO

While the demand for electrical goods has been fair this week, the only commodity that is moving rapidly is radio equipment. Many electrical houses are adding this line to their stocks and are pleased with the speed at which it is moving. The one difficulty all dealers are contending with is uncertain and constantly increasing deliveries. Dealers report that while complete sets are selling well, the favorite line seems to be spare parts. Whether this is an indication that the purchasers are beginners or are veterans reconstructing their old sets no one feels qualified to say.

Wiring materials have held their previous levels and outside of a few trifling reductions the weakened copper market has not produced any permanent change as yet. Poles and cross-arms are sluggish, but dealers are looking for greater activity when spring arrives and the utilities can start reconstruction of their lines.

Wire.—Market conditions on wiring materials have changed little from those existing during the past weeks. The majority of dealers say that business is poor, though occasionally a case of increased activity may be found. The weakness of the copper market has not been reflected in the price of copper wire so far, the No. 14 rubber-covered still selling for $6.75 per 1,000 ft. in 5,000-ft. lots. Stocks are fair to good. Weatherproof wire still sells for 16¾ cents per pound in 1,000-lb. lots. The base on bare wire is 16¾ cents.

Conduit.—The demand for conduit has been fair with few large orders. No price change has been reported and stocks are in fair condition.

Flexible Armored Conductor.—No price reduction has been announced on this conductor as yet. The No. 14 two-wire, double strip, sells for $45 per 1,000 ft. in 5,000-ft.

lots. The demand is fair but not startling and stocks are fair to good.

Lamp Cord.—Sales are moderate and dealers have ample stocks. The No. 18 cotton parallel sells for $16 per 1,000 ft., while the silk parallel is quoted at $27.50 per 1,000 ft.

Safety Switches.—Nearly all dealers state that business on these switches has been good. The large sizes are reported as moving the best. Dealers' stocks are in good condition.

Poles.—A quiet market on poles exists at this time, but since the inquiries are increasing, most jobbers feel that the spring will see a much better call for this line. No price change has been recorded and the 7-in.-top, 30-ft. Northern white cedar sells for $8.40 f.o.b. Chicago.

Cross-Arms.—The quietness in the pole demand is also found to apply to the cross-arm business, and jobbers feel that the sales curve on cross-arms will rise along with the sale of poles. There has been no price change since the last advance in January, and the 3¼-in. x 4¼-in. 3-ft. fir arm, in lots of 100, sells for $45.68 f.o.b. Chicago.

BOSTON

Trade showed little change in volume last week, business being chiefly confined to small orders with considerable variation in sales from day to day. Some breaks have occurred in the textile strikes which are hampering New England production, and many mills continue to operate satisfactorily. Building and engineering contracts for the week ended Feb. 14 in New England totaled $1,882,100, against $1,387,300 for the corresponding week of last year. Considerable scattered residential construction is evident in this district. Retail appliance trade is confined mainly to the lower-priced items, but some improvement is noted in the heavier lines. Release of "frozen" stocks of previously ordered goods is also beginning to show a better trend to business. Jobbers' stocks find no difficulty in meeting current demands except in the radio field, where deliveries are running into several weeks in typical cases. Underlying financial conditions are fairly good, barring apprehension lest the passage of bonus legislation by Congress strike business a staggering blow during this convalescent period. Prices show a tendency toward readjustment, with weaknesses in flexible armored conductor and cuts in the fixture field.

Flexible Armored Conductor.—Demand has picked up somewhat and prices are easier. No. 14 single-strip is quoted at $44.20 per 1,000 ft. in 1,000-ft. lots. Moderate improvement in building work absorbs more of this material.

Wire.—Sales are rather spasmodic. Local supplies are plentiful. Rubber-covered No. 14 wire sells at $6.75 per 1,000 ft. in 5,000-ft. lots and at $7.75 in 1,000-ft. orders. Weatherproof wire is moving slowly at slightly lower prices, and the latest price sheet runs as follows on sizes from No. 4-0 to No. 8 solid, per 100 lb.: Less than 25 lb., f.o.b. Boston, $26.25; 25 lb. to 100 lb., $21.25; 100 lb. to 200 lb., $19.25. An addition of 50 cents per 100 lb. is charged on slow-burning wire. Very little bare wire is moving at present.

Motors.—A better tone in the motor market is apparent, and withdrawals from factory stocks on suspended shipments held sometimes many months have begun to help the situation. Proposition work is active and while distributers' sales are spotty and on the whole light, an upward current in demand appears to have set in. Competition is sharp.

Fixtures.—Aggressive sales effort is moving fixtures in fair volume, but prices are unstable in retail circles. Stocks show little evidence of being broken to any great extent, and manufacturing has not yet hit a normal pace.

Porcelain.—Light movement of insulating material of this class is noted. "Nail-it" knobs are selling at $15.50 per 1,000 in barrel lots and ⅝-in. x 3-in. tubes at $4.50 in the same volume. No shortages have been reported in this material for a long time.

Air Heaters.—Sales have been fair in retail circles, considering the season, but no difficulty in maintaining stocks has been heard of. These devices are slowly getting into the staple class and move in response to vigorous merchandising methods.

Linemen's Tools.—No further complaints as to shortages are being voiced, following the late exhaustion of the local market as a result of the great sleet storm of early winter.

Lamps.—A surprisingly good trade continues to show the value of replacement business and to reward sales efforts in new fields. Improved house-lighting methods are attracting attention in this district and the industrial lighting work fostered by various electrical interests in the old Technology Building's exhibit continues to stimulate business.

ATLANTA

Continued inclement weather is interfering with the resumption of nearly all lines of business. The retail mercantile trade is, of course, suffering because of the disinclination of customers to come out, while construction has been held up by heavy rains followed quickly by freezing weather, so that nothing but interior construction has been continued during the past ten days. Electrical jobbers, therefore, have felt the reflection of this in their lines of construction materials, while the general quiet of trade has had a dampening effect upon the purchases of seasonal specialties by retail merchants and electrical dealers. Prospects for a revival are fair as building permits continue to be taken out in good volume, and a number of large central-station companies in this section are announcing considerable improvements and additions to plants and distribution systems. Local interests are preparing to launch a home-building campaign which will tend still further to stimulate local construction and relieve to some extent the lack of employment.

Farm-Lightning Outfits.—Jobbers report that a sales campaign in this line is productive of a fairly satisfactory volume of business, despite the continued poor financial condition in the rural districts. Inquiries in satisfactory number are being received. Stocks have fallen somewhat below normal.

Interphones.—With the exception of the more inexpensive type, few purchase orders are being received for interphone equipment. General stocks are good to heavy, with no change in price.

Poles.—There has been a slackening in pole purchases as danger of sleet has passed, but spring is not near enough at hand to permit of general line construction. Prices remain steady, with pole-yard stocks in good shape.

Pole-Line Hardware.—While still slow, a slight improvement in the movement of this line is to be noted during the past month. Increased sales are anticipated, however, as soon as line construction gets under way. Local stocks are in good condition with no price changes reported.

High-Tension Transformers.—The market at present is very dull, though there is every reason to anticipate a brisk movement in the spring as the plans of power companies in this section materialize. All jobbers report stocks fair with shipment at from four to twelve weeks.

Distribution Transformers.—The demand continues to hold up fairly well, particularly for the popular sizes. The large sizes are somewhat slow, owing to inactivity in industrial lines. Stocks are in fine shape in all lines.

Rigid Conduit.—Good to heavy stocks are reported on hand by all jobbers, and the market has slumped somewhat within the past ten days. There are a few inquiries for large quantities of special sizes reported, but they have not yet developed into definite sales.

Cross-Arms.—This item is following in the paths of poles and pole-line hardware, with local stocks reported as good to heavy. No changes in price are reported.

Lightning Arresters.—Anticipation of summer electrical storms is being reflected in the orders for this line and the activity will probably continue on the increase until late spring. Stocks are in good shape with prices steady.

ST. LOUIS

Jobbers noted some improvement in business last week, and it was fairly well distributed over all lines. However, there is still lacking any specific evidence of sustained improvement. All buying, whether by jobber, dealer or consumer, is on a hand-to-mouth basis, and extreme caution seems to mark every move. The general sentiment is improving nevertheless, and inquiries for prices on larger jobs are becoming more numerous, some developing into orders. The local steel companies, as a result of increased business, are now making plans for obtaining more economical plant facilities. The steel companies will also take advantage of the new plant which cokes Illinois coal to develop this territory as a steel center and consequently should soon be good buyers of electrical goods. Other industrial concerns have in mind numerous changes, but are awaiting improved business conditions, which are slowly developing. Residential wiring goods continue to sell in comparatively good volume. Merchandising goods are, on the whole, rather quiet, but improved activity is noted in ranges, washing machines, vacuum cleaners and fans. It is thought by most of the jobbers that business will show considerable improvement after the middle of March.

Washing Machines.—A fine business is generally reported. Jobbers' stocks are in good shape and dealers' stocks are as a rule low. One jobber reports that his stock was turned over three times in the last thirty days.

Vacuum Cleaners.—Business is spotty, but on the whole better than a month ago. Dealers are not stocking to any extent and jobbers are maintaining low inventories. The supply of one large jobber is exhausted, with a quantity of machines on back order.

Sewing Machines.—Sales are slow but fairly steady. Sewing-machine motors have virtually no demand. Stocks everywhere are in good condition.

Ranges.—Sales in the smaller communities have been comparatively good for some time, and sales in St. Louis, where the business has been dormant for about a year, are showing substantial improvement without special solicitation. Stocks are well in line with market requirements.

Flatirons.—Sales are about the same as they were a year ago and are good, considering the general condition of the market. Stocks of both dealers and jobbers are maintained on a low basis.

Curling Irons.—The demand has changed from the activity of a few months ago to quietness. Stocks are not unduly heavy.

Lamps.—While the sales are materially less than when the industrial plants were in full operation, a thriving business continues, with stocks in excellent condition. Nitrogen-filled lamps are continually increasing in demand. A large number of 50-watt and 60-watt type B lamps are sold here because of the central-station renewal policies.

Wire.—Price recessions were made last week. A grade of No. 14 rubber-covered which formerly sold for $6.70 per 1,000 ft. in 10,000-ft. lots now sells for $6.60. The base price on bare was reduced from 16½ cents per pound to 16.35 cents per pound, and that on weatherproof was reduced from 17 cents per pound to 16 cents per pound. Rubber-covered in the smaller sizes is selling well, and there have been good inquiries on weatherproof, but no orders of magnitude.

SEATTLE—PORTLAND

Progress toward recovery in business is rather slow. Business is generally conceded to be rather dull so far as the electrical jobbers in the Puget Sound region are concerned, while jobbers and manufacturers of Portland, although they report business as quiet, have no apprehension for the future. In fact, the general tone is very optimistic and inquiries are coming in very satisfactorily. A few good orders have been placed within the past week and many more are expected in the near future. Manufacturers report an appreciable activity in motor sales. Manufacturers' and jobbers' stocks are in good shape, although they are not overstocked. New enterprises now starting up are few in number and relatively unimportant except in the building field, where considerable activity is found. A number of projects which have been under way in Seattle for some time are progressing. Among these are the improvements to Seattle's water-supply system, involving the expenditure of about $2,000,000, the Skagit power project of the city of Seattle, and the Cushman power project of the city of Tacoma, on which preliminary work is being done.

Contracting and fixture installation work in Portland seems to be very active at present. Dealers' sales, while better than last month, are not so active as was anticipated for this time, but prospects are very good for the near future. During 1921 Portland issued permits for 2,890 residences with a total value of $10,100,700. Apartment-house building, however, was not so active proportionately. The outlook for 1922 is exceptionally promising and many apartment houses are in prospect. All of the better class probably will be equipped with electric ranges throughout. The soldiers' bonus bill has stimulated activity in residence building, and it is predicted that 7,000 residences will be constructed under this act. Jobbers of Portland report a drop of 7 to 7½ per cent in pole-line hardware.

Insulators.—Quotations on insulators are as follows: No. 9, pony glass, $52.85 per 1,000 in lots of 10,000; No. 20, deep-groove, double-petticoat insulators, $81 40 per 1,000 in lots of 10,000.

Household Appliances.—Washers and cleaners maintain a fair volume of sales. Demand for ranges in Seattle has slowed up a good bit. In Portland, however, the volume of range sales is fair, owing probably to a co-operative selling campaign between the dealers and the local power companies.

SAN FRANCISCO

Roughing-in material and pole-line construction material are the most popular lines at present. Appliance sales are slow and where made are almost in spite of the public.

Porcelain Material.—Radical price changes have been made in practically all standard porcelain material, averaging about 40 per cent on the whole line. No. 334 unglazed cleats are now being quoted at about $15.50 per 1,000, while No. 5½ split knobs are selling at $10.80 per 1,000 and 3-in. x $\frac{5}{16}$-in. tubes at $5 per 1,000. The demand for knobs and tubes is very good, running about 20 per cent better than last year. Cleat sales, however, are rather slow and there are large local stocks. "Nail-it" knobs are unchanged in price, selling for about $24.50 per 1,000 for the tenpenny size. This kind of knob is far outselling the old split style.

Bushings.—A 10 per cent decrease is effective in bushings and lock nuts, 1½-in. bushings selling for $1.25 per 100 in cartons or packages and ¾-in. for $1.75 per 100. The ½-in. lock nuts are quoted at 54 cents per 100 and ¾-in. for 72 cents per 100 in cartons or packages. The demand is very good, but stocks have kept pace with it.

Rubber-Covered Wire.—The market has dropped about 25 cents per 1,000 ft. for the No. 14 single-braid solid, approximately $7.25 per 1,000 ft. being generally quoted on 5,000: ft. quantities. No. 14 duplex is selling for about $10 per 1,000 ft. in the same lots.

Storage Batteries.—This is the quiet season, but it is also a season of transition. Many of the smaller service stations have gone out of business, and several of the unsteady ones have considerably unsettled the market by their quotations. Keen competition exists among the manufacturers, each one striving to place its product seemingly at any terms.

Tools.—It is reported that the power companies are working on a standardization scheme for linemen's tools, such as belts, climbers, safety straps and the like.

Household Appliances.—Vacuum-cleaner sales have been fairly good, principally because of low payment terms—in some cases as low as $1 down and $1 per week. It is all solicited business, very few sales being made from the stores, and electrical dealers who do not maintain sales crews are reporting very poor business. The same condition applies on washers except that they have been rather neglected in favor of vacuum cleaners. The smaller appliances in general are moving rather slowly and this condition is even worse from the jobber's standpoint because of the large, well-assorted stocks carried over by most dealers from the holidays.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Acme Wire Increases Production

The Acme Wire Company, Hamden, Conn., is increasing production at its plant and has recently added more than 100 persons to the force. Orders have been taken for 150,000 coils of wire from the Ford Motor Car Company, Detroit, Mich.

Allis-Chalmers Reports Fourth Quarter Sales

For the fourth quarter of 1921 sales billed by the Allis-Chalmers Manufacturing Company, Milwaukee, amounted to $4,645,054, which was about 12 per cent under those for the third quarter. Net profit after provision for federal taxes amounted to $384,032. Of this $100,000 is the result of an adjustment on the contingency and tax reserve set up in excess of requirements in the early part of 1921 and now written back to earnings. Unfilled orders on hand as of Dec. 31, 1921, are large, amounting to $7,300,574. This compares favorably with those at the end of the third quarter, totaling $7,260,574. On the basis of the company's quarterly reports sales in 1921 are shown as $24,685,257, compared with $31,513,209 in 1920 and with $30,224,082 in 1919, while net profits in 1921 were $2,215,466, against $3,564,348 in 1920 and $3,599,713 in 1919.

Casting Manufacturer to Have New Plant

The Electric Foundry & Equipment Company Philadelphia, is erecting a two-hundred-thousand-dollar plant at Tacony and Bleigh Streets in that city. Announcement has been made by William P. Cunningham, president, that the first work will be turned out about April 1. Steel castings up to 200 lb. will be manufactured on completion of the plant.

Pole Producers' Convention Sees Fair 1922 Prospects

Members of the Northern White Cedar Association at their convention held in Minneapolis on Jan. 31 and Feb. 1 expressed themselves to a representative of the ELECTRICAL WORLD as believing that 1922 holds good but not phenomenal prospects. There are, they stated, a number of stumbling blocks on the road to prosperity, among them high freight rates, lower prices and high production costs, agricultural and general business depression, but these conditions will gradually readjust themselves, it is hoped. On the bright side is the greater prosperity of a large number of utilities and their avowed intention of line construction this summer. Business, during 1921, it was declared, was much below normal, in some cases amounting to under 50 per cent of 1920 business, but at present inquiries are picking up, particularly for telephone-line work. One concern, it was reported, has been able to increase the working day of its preservation plant to sixteen hours.

New officers of the association were elected as follows: President, W. B. Thomas, White Marble Lime Company, Manistique, Mich.; vice-president, W. H. Schuessler, Coolidge-Schuessler Company, Minneapolis; treasurer, Harry F. Partridge, P. M. Partridge Lumber Company, Minneapolis.

Electrical Jobbers' Club Elects Officers for 1922

At the annual meeting of the Electrical Jobbers' Club, held Feb. 7 at the Hotel Breslin, New York, officers for the coming year were elected as follows: President, G. L. Patterson, Stanley & Patterson, Inc.; vice-president, W. H. Vogel, W. R. Ostrander & Company; secretary and treasurer, W. J. Kroeger. The executive committee comprises W. J. Kranzer, Crannell, Nugent & Kranzer, Inc.; H. T. Hochhausen, Brooklyn Electrical Supply Company; H. O. Foreman, Sibley-Pitman Electric Corporation; G. V. Weir, Fullerton Electric Company; L. D. Baily, Baily Electrical Supply Company, and M. Zucker, A. Shemel & Company.

Anaconda and American Brass Formally Merge

At the annual meeting of the stockholders of the American Brass Company, held on Feb. 14, the formal merger of the company with the Anaconda Copper Mining Company was effected. John G. Ryan, chairman of the board of directors; C. F. Kelly, president of the board, and Benjamin F. Thayer, vice-president of the board, all three officers of the Anaconda company, were chosen as members of the board of the American Brass Company. Officers of the American Brass company were elected as follows: Chairman of the board, Charles F. Brooker; vice-chairman and first vice-president, John P. Elton; president, John A. Coe; executive vice-presidents, Edward I. Frisbie, Thomas B. Kent and Gordon W. Burnham; treasurer, Clifford F. Hollister; assistant treasurers, Major W. Judge and A. B. Terry; secretary, Edmund H. Yates; assistant secretary, Elton G. Wayland.

Catton-Neill See Better Hawaiian Business

Although construction in the Hawaiian Islands is not particularly active there are signs of a substantial improvement in general business conditions which before long will be reflected in the electrical trade, according to a statement made recently to a representative of the ELECTRICAL WORLD by John Hood, assistant manager of Catton, Neill & Company, Ltd., Honolulu. Mr. Hood, who was formerly engineer for the General Electric Company in San Francisco and has been visiting in California during the past few weeks, expressed himself as being quite optimistic over the outlook in the islands. With the increase in trade between the Far East and the Pacific Coast which is bound to come, it is foreseen that the islands will benefit proportionately.

Edison Lamps Now in Six-Lamp Carton

The Edison Lamp Works of the General Electric Company, Harrison, N. J., have announced that from now on all of their lamps, except the S-14 bulb, will be packed in six-lamp cartons. This step was taken after many months of research into the best method of packing and was put into effect during January in nearly all the Edison factories.

The plan is, with the exception noted, to pack all lamps rated at from 10 watts to 75 watts inclusive in six-lamp cartons and to pack either ten or twenty of these cartons in a case, making the packing quantity either 60 or 120 lamps. The cartons will be in three sizes. The design and coloring have been made attractive in order to fit display purposes.

General Railway Signal 1921 Sales Under Normal

Sales during 1921 of the washing machines and foundry products made by the General Railway Signal Company, Rochester, N. Y., were far below normal, according to the annual report of the company, just made public. The report also states that the company is able to furnish the automatic stop and control devices required on forty-nine railroads by the order of the Interstate Commerce Commission. The report reads as follows:

"Owing to the general business depression in 1921, sales of our washing machines and foundry products were far below normal. It is our belief that such sales will increase in substantial conformity with improvement in general industrial and agricultural conditions. The earnings of railways not having been up to normal in 1921, their purchases of all kinds of equipment have been small; but with improvement in earnings it is believed buying of much needed equipment will be resumed.

"In January, 1922, the Interstate

Commerce Commission issued an order providing that forty-nine railroads subject to the interstate commerce act are required to install on or before July 1, 1924, an automatic train stop or train-control device to be applied to or operated in connection with all road engines running on or over at least one full passenger locomotive division of each one of these forty-nine railroad properties.

"For more than ten years our company has been engaged in the development of both automatic train-stop and automatic train-control devices and has made and patented many valuable inventions, and has by purchase and license acquired rights under many other patented inventions in these fields. We are, therefore, in an excellent situation to furnish dependable devices of the required character as well as the block signaling systems in conjunction with which they should be employed."

New Lamp Company Established

The Salem (Mass.) Lamp Company has opened a factory on Saunders Street in that city for the refilling of lamps. Charles S. Breslan, who has had twenty-five years' lamp-making experience, is president.

Central and Atlantic Jobbers to Hold Meetings

Plans have been announced for holding the next regular meetings of the Central Division and Atlantic Division of the Electrical Supply Jobbers' Association, the latter in New York Feb. 28 and the other in Chicago Feb. 27 and 28. The New York meeting will be at the Hotel Commodore, the first session being called to order at 10:30 a.m. and the final session adjourning before 5 o'clock in the evening of the same day. It was announced that an interesting and instructive program had been arranged, and a large attendance is expected to be present at this first meeting of the year.

The Hotel Sherman, Chicago, will be the scene of the Central Division meeting, which will open at 10:30 a.m. Feb. 27 and will adjourn at 11:30 a.m. Feb. 28. The tentative program for the first day is as follows: "Financing Motor Cars for Salesmen," by P. A. Borly, vice-president G.-Q. Electric Company, Milwaukee; "Credit Conditions as They Exist After an Interval of Six Months," by Frederick P. Vose, general secretary N.E.L.A.; "Sell 'Em Something More," by R. W. Sherman, merchandise director of the Automotive Equipment Association. On the second day there will be a talk on "Turnover" by F. D. Van Winkle, president of the Post Glover Electric Company, Cincinnati. A general discussion of reduction of operating expenses is on the program to close the meeting.

Following these two division meetings there is scheduled a meeting of the executive committee of the national association, to be held in Atlantic City, March 1 and 2.

Westinghouse Official Sees Good Foreign Trade Prospects

A statement issued by E. D. Kilburn, vice-president and general manager of the Westinghouse Electric International Company, evinces optimism over the prospects for American exports of electrical equipment in 1922 and declares that European and especially German competition in the electrical field cannot seriously affect America.

"America leads the world in many electrical lines," the statement declares, "and, as has been proved on a number of occasions recently, can compete with any nation in these lines in spite of her high labor costs. Another reason for not fearing German competition is that the manufacturing capacity of Germany is limited and that when she has obtained a certain amount of electrical business her deliveries will become uncertain and her prices will rise.

"We should be optimistic over the propects for American exports of electrical equipment during 1922, for during the past year both Chile and Japan placed large orders for electrical material in America and there is every reason to believe that we shall receive an increasing amount of business of the same character. Every generator installed immediately creates a market for at least three times its capacity in smaller apparatus, such as transformers, meters, industrial motors and domestic ware. Hence the demand for electrical appliances increases in a geometrical ratio and America is in a fair position to get its full share of this rapidly growing business.

"There is, however, a problem that still faces the exporter," Mr. Kilburn goes on. "Unless the American public, led by American financiers, becomes interested in investing money in foreign securities, American exporters are bound to be handicaped. Many European countries habitually buy large amounts of such securities each year, and the money thus raised is naturally spent in the country of its origin. We have made great strides in this direction, as the numerous foreign loans floated here testify, but there is still ample room for constructive educational work on the part of bankers along these lines."

Western Instrument Company Increases Capacity

The Western Instrument Company, 1001 Washington Boulevard, Chicago, has acquired 8,000 sq.ft. of factory space at this address. This company was recently incorporated to manufacture surgical, veterinary, dental and electrical therapeutical instruments, dies, tools and patterns. They are also engaged in brass finishing, polishing and plating. Julius Severus, vice-president and general manager, stated to a representative of the ELECTRICAL WORLD that there had been a gradual but steady increase in business in the last two months. While he was not over-optimistic about business in the future, he felt that things were on the mend and business would pick up, not by spurts, but in a gradual slow upward climb. The officers of the company are: William Ganschow, president; Julius Severus, vice-president and general manager; Charles F. Johnson, secretary, and Lewis B. Mahon, treasurer.

The P. A. Geier Company, Cleveland, has a new distributing office for Royal Electric Cleaners and other products at 1,400 Broadway, New York, under the management of Harry A. Bell.

The Maring Wire Company, Muskegon, Mich., manufacturer of magnet wire, has made Charles A. Etem, 917-A Marquette Avenue, Minneapolis, sales engineer for Minnesota and North and South Dakota.

The McLain-Simpers Organization, 210 West Washington Square, Philadelphia, has moved its Charlotte (N.C.) branch office to Greenville, S. C., where it will be more centrally situated in the Southern textile field. A. R. St. John has been made manager of the New York office and will temporarily remain in charge of the Boston office.

The McClave-Brooks Company, Scranton, Pa. manufacturer of stokers, grates, etc., has appointed K. S. Holmes, Jr., Cincinnati representative. He will have an office at 511 Gwynne Building.

The Kerite Insulated Wire & Cable Company, 30 Church Street, New York, incorporated in Connecticut, has filed notice of increase in capital from $200,000 to $350,000.

Henry D. Sears, 80 Boylston Street, Boston, general sales agent of the Weber Electric Company, Schenectady, N. Y., manufacturer of electric wiring devices, announces the opening of a sales office at 342 Madison Avenue, New York City, to cover the metropolitan district. It will be in charge of Henry E. Nickerson, who for the past eleven years has been New England representative of the company.

The Whitlock Coil Pipe Company, Hartford, Conn., has appointed George D. B. Van Tassel to represent its interests in Detroit and vicinity in addition to its regular agents and representatives.

The Chillingworth Engineering Corporation, 143 Liberty Street, New York, has associated with itself Messrs. Frank H. Plum, Herbert Pluemer, George E. Mellin and Harold Von Thaden, all formerly of the C. W. Hunt Engineering Corporation. It announces that this step has been taken with the approval and consent of the Hunt company.

Coleman-Shoemaker, Inc., power machinery repairers, Philadelphia, have moved to their new plant at Twentieth and Clearfield Streets, that city. There the company has a private railroad siding and an overhead traveling crane, making it possible to handle both light and heavy machinery with greater facility than at the old plant. The company has also announced that it is in a position to store machinery either in its warehouse or outdoors.

Foreign Trade Notes

THE METROPOLITAN VICKERS ELECTRIC COMPANY, Manchester, England, the *Journal of Commerce* states, has obtained the contract for material for the electrification of the South African Railways, amounting to about £1,000,000. The contract will include at least seventy locomotives. This is regarded as breaking German competition in electrical equipment trade in South Africa.

HYDRO-ELECTRIC SCHEMES FOR NEW ZEALAND—Extensive hydro-electric projects are under way by the New Zealand government, according to *Commerce Reports*, involving an expenditure of approximately £20,000,000, the work to be evenly divided between the two islands. The present plans provide for a high-tension transmission system for both islands which will connect all the main supply points of the power board districts and local power authorities. Each of these transmission systems will be fed from three or four hydro-electric stations, existing steam and hydro-electric plants being incorporated in the general scheme. The standard three-phase, 50-cycle system has been adopted in all the recent installations, and some of the older plants are being converted to standard. A list of the government projects in New Zealand now under construction or being contemplated, together with the name of the government electrical engineer, may be obtained on application to the electrical equipment division of the Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to miscellaneous exhibit No. 232.

ITALIAN ELECTRIC LAMP TAX.—A decree establishing a tax on the manufacture of electric lamps, according to reports to the Department of Commerce, has been passed in Italy, to be imposed as follows: (a) Lamps for illumination by any system, up to 10 watts, carbon filament, 0.25 lira, other 0.50 lira; from 11 to 50 watts, carbon filament, 0.75 lira, other 1.50 lire; from 51 watts to 200 watts carbon filament, 1.50 lire, other 3 lire; from 201 upward, carbon filament, 3 lire, other 6 lire, (b) Arc lamps, excluding pure or metalized carbon, 3 lire per kilogram, (c) Pure or metalized carbon, or any other system of electric illumination by arc, 2 lire per kilogram.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired by a firm in Spain (No. 806) for the sale of electric vehicles, storage batteries and electrical supplies for automobiles.

Catalogs are desired by a transportation company in Brazil (No. 809) with a view to purchasing and also securing an agency for heavy electric trucks for hauling baggage and freight over streets paved with stone. It is expected that fifty trucks will be purchased by this company alone for its own use.

A commercial agency firm in Sweden (No. 828) desires to secure the representation of firms for the sale of automobile accessories, particularly for improving the lighting facilities of a low-priced automobile.

There is a market in Spain (No. 837) for wood pipes for use in hydro-electric developments, water conduits and irrigation canals.

EQUIPMENT FOR ELECTRICAL PLANT IN DURBAN, SOUTH AFRICA.—Bids will be received by the Corporation of Durban, Electrical Department, South Africa, until April 12, according to the *Electrician*, for two 500-kw. rotary-converter automatic substation equipments. Alternate bids for mercury-arc rectifiers may be submitted instead of rotary converters, the switchgear to be completely automatic.

ELECTRIFICATION OF BOLOGNA-MONFALCONE (ITALY) RAILWAY.—The Director General of Italian State Railways, according to *Commerce Reports*, announces that the administration is desirous of receiving bids for the electrification of the Bologna-Venice-Monfalcone Railway, which work is to be intrusted to private enterprise. Bids will be opened on April 30, 1922, at the Direzione Generale Ferrovie dello Stato, Rome, where full details regarding the work may be consulted.

BAYCROFT BROTHERS, Victoria Street, Cambridge, New Zealand, would like to receive catalogs from manufacturers of electrical equipment as follows: Alternating-current motors, 400 volts, 50 cycles, three-phase; fractional-horsepower motors, single-phase; household electrical appliances and electrical fittings.

New Apparatus and Publications

RANGE—The George D. Roper Corporation, Rockford, Ill., has recently placed a new electric range on the market.

GEAR SHIFT.—The Cutler-Hammer Manufacturing Company, Milwaukee, has brought out a new type of gear-shift device (electrically operated) for motor cars.

COUPLING.—The Kay Manufacturing Company, Norwalk, Conn., is distributing circular No. 1922, describing the "Whitney" free floating coupling.

INSULATING MATERIAL.—"An Electric Test" is the title of a small booklet published by the Rogers Fibre Company, 121 Beach Street, Boston, which contains a report made by the Electrical Testing Laboratories of New York, showing the comparison of two processes of treating paper for insulating purposes, "Leatheroid" treated with sulphuric acid, and the other with chloride of zinc, and the method used in making tests.

RADIO MATERIAL.—The Manhattan Electrical Supply Company, Inc., 17 Park Place, New York City, is distributing its new "Wireless Manual", which is a catalog of radio material. It is also a textbook and contains a brief survey of the science, giving valuable information for the amateur.

INSULATING VARNISH—The Acme Wire Company, New Haven, Conn., has issued engineering bulletin No. 1, in which it calls the attention of engineers and manufacturers of coils to the changed requirements in the treating of coils for protection against moisture.

GATE VALVE. — Bulletin 100-A issued by Payne Dean, Ltd., 103 Park Avenue, New York City, describes and illustrates the "Dean" controlled gate valve.

DRILL AND GRINDER.—The Wodack Electric Tool Corporation, 23-27 South Jefferson Street, Chicago, has recently developed a new "Wodack" combination portable electric drill and grinder.

LIGHTING PLANTS. — The Matthews Engineering Company, Sandusky, Ohio, has added to its line of lighting plants sets up to 40 kw. in direct-current and up to 75 kva. in alternating-current.

SIGNS.—A leaflet describing its "Radio" electric signs is being distributed by the Efficient Electrical Display Company, Inc., 26 Court Street, Brooklyn, N. Y.

STOVE.—The Simplex Heating Company, 85 Sidney Street, Cambridge, Mass., is distributing bulletin No. 104, describing its "Simplex" electric breakfast stove, recently placed on the market.

ILLUMINATION.—"Brascolite Bulletin," architectural series No. 4, issued by The Brascolite Company division of the St. Louis Brass Manufacturing Company, St. Louis, gives illustrations of various salesrooms equipped with "Brascolites," "Aglites" and other "Brascolite" products.

LIGHTING FIXTURES.—The St. Louis Brass Manufacturing Company, St. Louis, is distributing an eight-page catalog covering its "Polynamel" line of lighting fixtures.

New Incorporations

THE VECO MANUFACTURING COMPANY, Norwalk, Conn., has been incorporated to manufacture and sell wiring devices with a capital stock of $50,000. The incorporators are Joseph A. Volk, Jr., South Norwalk, George G. Ernst and J. W. Ernst, both of Norwalk.

THE ELECTRICAL DEVELOPMENT CORPORATION, Butte, Mont., has been incorporated with a capital stock of $50,000 by A. Blaustein, E. N. Genzberger, J. Fischer, Louis Pohndorf, G. W. Mikel and S. Genzberger.

THE MORRIS LIGHT & POWER COMPANY has been organized with a capital stock of $10,000 by Joseph Weisenbach, John Nordmeyer, C. J. Bramlage, Aloys Bischoff and Anthony Haskamp.

THE TARGHEE POWER COMPANY, Pocatello, Idaho, has been incorporated with a capital stock of $300,000. N. P. Bean, James M. Ingersol and E. C. White are incorporators.

Record of Electrical Patents

Notes on United States Patents

(Issued Jan. 31, 1922)

1,404,885. POLYMORPHOUS DYNAMO ELECTRIC MACHINE; Alexander Nyman, Wilkinsburg, Pa. App. filed June 19, 1918. Produces high-frequency currents for wireless.

1,404,900. TROLLEY HANGER; William Schaake, Pittsburgh, Pa. App. filed Feb. 4, 1918. Supports plurality of conductors from messenger cable.

1,404,910. MAGNET-LOCKING DEVICE; Olof Thompson, New York, N. Y. App. filed Nov. 10, 1917. Movable part of solenoid locked when closed.

1,404,932. ELECTRIC SYSTEM; Mark C. Cosgray Port Clinton, Ohio. App. filed Dec. 29, 1915. Battery system for feeding electrical devices.

1,404,933. ELECTRIC REGULATION; John L. Creveling, White Plains, N. Y. App. filed Aug. 17, 1916. On storage-battery charging sets.

1,404,953. ELECTRICAL RECEPTACLE; Walter M. Gilbert, East Hartford, Conn. App. filed Oct. 11, 1917. Safety-switch cabinet.

1,404,979. ELECTRIC HEATING UNIT; Henry Kruesheld, New Washington, Ohio. App. filed Feb. 1, 1921. Self-contained fuse.

1,405,041. OPERATING DIRECT-CURRENT MOTORS; Isidor Kitsee, Philadelphia, Pa. App. filed March 21, 1919. To start and stop at predetermined speeds.

1,405,042. ELECTRIC COOKING UTENSIL; Henry Kruesheld, New Washington, Ohio. App. filed Feb. 1, 1921. Waffle iron, griddle and toaster combined.

1,405,060. APPARATUS FOR RECORDING THE DURATION OF SOUNDS AND INTERVALS OF SILENCE; Frank E. Mosley, Shettleston, Glasgow, Scotland. App. filed Nov. 29, 1920. For the description of moving pictures by phonograph.

1,405,117 to 1,405,130. METHODS AND APPARATUS FOR DEHYDRATING PETROLEUM EMULSIONS; Ford W. Harris, Los Angeles, Cal. Applications filed from May 29, 1917, to June 28, 1921. Fourteen patents describing methods and apparatus for taking water out of petroleum oils by means of an electric current.

1,405,133. ELECTRICAL INSTRUMENT BOARD; Bryson D. Horton, Detroit, Mich. App. filed Jan. 29, 1918. Made of sheet metal.

1,405,175. TELEPHONE SYSTEM; George A. Yanochowski, Chicago, Ill. App. filed Aug. 22, 1919. Ringing on automatic system.

1,405,217. DENTAL FILM HOLDER; William O. Houser, Lincoln, Ill., App. filed March 3, 1920. Used with X-ray apparatus.

1,405,267. TELEPHONE AND WIRELESS TELEGRAPHY INSTALLATION; Leon N. Brillouin, Paris, France. App. filed June 19, 1918. Connections of tubes.

1,405,270. GUIDE FOR CURRENT COLLECTORS; Cyrus B. Buchanan, New York, N. Y. App. filed Nov. 17, 1921. For double trolley wires at intersections.

1,405,287. ELECTRICAL LAMP; Joseph A. Clifford, Washington, D. C. App. filed Jan. 21, 1921. For illuminating theater stages.

1,405,338. AUTOMATIC SWITCH; Ludwig Schon, Essen-on-the-Ruhr, Germany. App. filed April 20, 1912. Alternately closes and opens in definite intervals.

1,405,345. MEANS OF CONTROL FOR PETROL ELECTRIC VEHICLES; Percy F. Smith, Kent, England. App. filed Aug. 9, 1917. Combined gas engine and electric drive on automobiles.

1,405,348. TROLLEY RETRIEVER; Sidney H. Springman, Torrance, Cal. App. filed April 27, 1920. To maintain connection when wheel disengages.

1,405,369. AUTOMATIC MAGNETIC LOCK; Edwin M. Watson, Boston, Mass. App. filed June 20, 1919. For double doors in forced-draft boiler room on ships.

(Issued Feb. 7, 1922)

1,405,428. SIGNAL-TRANSMITTING SYSTEM; Harold S. Osborne, New York, N. Y. App. filed June 21, 1918. Corrects wave form of impulses at intervals along communication line.

1,405,455. ELECTRICAL PROTECTIVE DEVICE; Robert M. Spuck, Schenectady, N. Y. App. filed Oct. 10, 1917. Relay of retarded or time-limit type.

1,405,469. AUTOMATICALLY OPERATING MEANS FOR CONTROLLING RHEOSTATS OR EQUIVALENT DEVICES; Pliny K. Westcott, New York, N. Y. App. filed Jan. 17, 1920. Motor operated by variations in voltage.

1,405,472. TELEPHONIC RECEIVER; Alfred Williams and Leo D. Williams, London, England. App. filed Jan. 12, 1917. Use made of the thermophone effect.

1,405,475. ELECTRIC LIQUID HEATER; William A. Andrews, Detroit, Mich. App. filed March 11, 1920. Employs liquid to be heated as resistor element.

1,405,493. MOTOR CONTROLLER; Allan J. Cline, Chicago, Ill. App. filed Dec. 30, 1918. For variable-speed motors.

1,405,497. ARMATURE BRUSH HOLDER FOR ELECTRIC TOY DYNAMOS; Joshua L. Cowen, New York, N. Y. App. filed April 15, 1920. One-piece construction of sheet metal.

1,405,501. REPEATER NETWORK SELECTING APPARATUS; Charles S. Demarest, Brooklyn, N. Y. App. filed July 9, 1919. Means for balancing telephone line.

1,405,502. ELECTRIC MOTOR; Lee L. Dodds, Brooklyn, N. Y. App. filed June 26, 1920. Step-by-step clock mechanism.

1,405,506. METHOD OF AND MEANS FOR HEATING PRINTED SHEETS; James E. Doyle, Cleveland, Ohio. App. filed Nov. 11, 1919. Removes static electricity and dries the sheet of paper.

1,405,519. BRUSH MOUNTING; Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed April 11, 1919. Auxiliary brushes to operate with main brushes.

1,405,523. AUDION OR LAMP RELAY OR AMPLIFYING APPARATUS; Marius C. A. Latour, Paris, France. App. filed Dec. 28, 1917. To determine the construction of transformers used.

1,405,532. ELECTRICALLY LIGHTED VANITY CASE; Louis Marko, Dayton, Ohio. App. filed April 6, 1921.

1,405,536. ELECTRICAL SYSTEM; John L. Milton, Louisville, Ky. App. filed Feb. 26, 1919. Magneto frame with polar members spaced axially.

1,405,596. BRUSH HOLDER; John D. Karle, Roselle Park, N. J. App. filed May 10, 1919. Tubular type for small machines.

1,405,608. SECTIONAL INSULATOR; Samuel S. Matthes, Mansfield, Ohio. App. filed Aug. 3, 1921. For sectionalizing high-voltage trolley conductors.

1,405,609. CONDUCTOR SUPPORT; Samuel S. Matthes, Mansfield, Ohio. App. filed Sept. 3, 1921. Supports trolley conductor from a catenary cable.

1,405,616. DYNAMO-ELECTRIC MACHINE; Paul A. H. Mossay, London, England. App. filed Sept. 12, 1919. Designed with channels for cooling.

1,405,624. ELECTRICALLY HEATED FIRELESS COOKER; Ralph J. Patterson, Boston, Mass. App. filed Oct. 5, 1920. Attachments for heating fireless cookers.

1,405,627. BATTERY; Earnest J. Petrie, Los Angeles, Cal. App. filed Nov. 22, 1920. Amorphous silica between plates and casing of storage battery.

1,405,630. FLASHLIGHT; Francis M. Rosenfeld, Elberon, N. J. App. filed May 2, 1918. Tubular light with hook to attach to object.

1,405,640. ELECTRICALLY CONTROLLED TRANSMISSION; Max Taigman, New York, N. Y. App. filed May 17, 1918. For machines subjected to rapidly reoccurring intermissions in their operation.

1,405,673. FIRE-ALARM TELEGRAPH; Lewis Degen, Oakland, Cal. App. filed Nov. 13, 1919. One mechanism for alarm code, another for trouble code.

1,405,702. STORAGE BATTERY; William H. Wood, South Euclid, Ohio. App. filed March 31, 1920. Lead oxide plate impregnated with animal hair.

1,405,703 STORAGE BATTERY; William H. Wood, South Euclid, Ohio. App. filed June 1, 1920. Lead compound plate impregnated with short fibrous sections of animal matter.

1,405,762. FURNACE; Thomas S. Curtis, Providence, R. I. App. filed Dec. 13, 1919. Electric furnace adapted for sintering or calcining ores.

1,405,767. CHANGEABLE EXHIBITOR; Thomas L. Easley, San Antonio, Tex. App. filed Sept. 25, 1919. Plurality of signs intermittently and successively displayed.

Construction News

Projects, Plans, Bids and Contracts Contemplated or Under Way

New England States

CONCORD, N. H.—The Board of Aldermen are considering petitions for better lighting facilities from residents of Dimond Hill, Loudon Road, Iron Works Road, Elm Street, Penacook and the Plains district.

CAMBRIDGE, MASS. — A one-story power house, 50 ft. x 60 ft., will be erected by the Mason & Hamlin Company, 492 Boylston Street, Boston, at its new piano plant comprising six buildings, in Cambridge, for which bids have been taken. Monks & Johnson, 99 Chauncey Street, Boston, are engineers.

CAMBRIDGE, MASS.—The Cambridge Electric Light Company has commenced work on its new substation, 80 ft. x 180 ft., for which general contract has been let. Bids for electric equipment, etc., will be asked in about sixty days. French & Hubbard, 210 South Street, Boston, are engineers.

EVERETT, MASS.—Motors and other electrical power and mechanical equipment will be installed in the power department of the new high school to be erected on Broadway, to cost about $750,000. Ritchie, Parsons & Taylor, 15 Ashburton Place, Boston, are architects.

WALTHAM, MASS.—The Edison Electric Company has entered into an agreement with the city authorities whereby the company will spend $20,000 annually for the next five years for placing its wires underground.

BRIDGEPORT, CONN. — Steps have been taken by residents of the East Side to secure the installation of an ornamental lighting system on a portion of Stratford Avenue.

MANCHESTER, CONN.—The Board of Selectment is considering the installation of a new police signal system, to cost about $6,000.

NEW HAVEN, CONN.—A movement has been started by the Grand Avenue Business Men's and Property Owners' Association for extension of the ornamental lighting system on Grand Avenue from East Street to James Street.

Middle Atlantic States

BUFFALO, N. Y.—A rotary generator, transformers, 300,000 ft. of conduit, eight electrically operated passenger elevators and four electric freight elevators and other electrical equipment will be installed in the new hotel now being erected by the Statler Hotel Company.

NEW YORK, N. Y.—The New York Edison Company has filed plans for the erection of a two-story substation, 25 ft. x 100 ft., at 33 Attorney Street, to cost about $75,000:

YONKERS, N. Y.—The Yonkers Electric Light & Power Company, 9 Manor House Square, has taken bids for the erection of its new power plant to cost about $250,000. Thomas E. Murray, 55 Duane Street, New York, is engineer.

MORRIS PLAINS, N. J. — The street-lighting committee of the Hanover Township Committee is considering extensions to the street-lighting system, including a total of seventy-two lamps.

NEWARK, N. J.—Electric power equipment, motors, etc., will be installed in the proposed county vocational school to be erected at Bloomfield, to cost about $500,000. Guilbert & Betelle, 546 Broad Street, are architects.

NEWARK, N. J.—The Department of Parks and Public Property, City Hall, is arranging an appropriation of $117,200 for the construction of the proposed new power plant at the municipal market, of which about $36,000 will be used for alterations in the present building to provide for the station. It is also proposed to install a complete refrigerating plant to cost about $135,000, of which amount over $120,000 will be expended for machinery. Frank Grad, 245 Springfield Avenue, and George B. Hooper, 116 Market Streets, are architects.

PERTH AMBOY, N. J.—The Board of Aldermen is considering plans for the installation of an ornamental street-lighting system on New Brunswick Avenue.

ALLENTOWN, PA.—The Pennsylvania Power & Light Company has arranged for an increase in capital stock from 50,000 to 150,000 shares. A portion of the proceeds will be used for extensions and improvements to its system.

ALLENTOWN, PA.—The M. & G. Ice Cream Company will construct a 1,500-kw. substation at its new local plant, now in course of erection. The motor installation at the factory will approximate 1,000 hp. The H. N. Crowder, Jr., Company, Allentown, has charge of the installation.

GREENSBURG, PA.—A power house will be built in connection with the erection of an addition to the Westmoreland Hospital. Edward L. Tilton, 52 Vanderbilt Avenue, New York, N. Y., is architect.

PHILADELPHIA, PA.—The Bloch Go-Cart Company, 1136 North American Street, has completed plans for the erection of a power house at its plant. W. E. S. Dyer, Land Title Building, is engineer.

PHILADELPHIA, PA.—A power house will be built in connection with a group of buildings to be erected at the Presbyterian Hospital, in Philadelphia, to cost about $3,000,000. Dr. H. G. Paul is president of the board.

PHILADELPHIA, PA. — Bids will be received at the office of William S. Twining, Director Department of City Transit, 1211 Chestnut Street, until Feb. 28 for constructing signal towers and remote control houses (Contract 586) and for furnishing and installing underground cables (Contract 608) along the Frankford Elevated Railway between Arch and Bridge Streets.

POINT PLEASANT, PA.—The Plumstead Township-Buck County Electric Company is being organized by officials of the New Jersey & Pennsylvania Traction Company, Trenton, N. J., to operate a power plant at Point Pleasant and other parts of Plumstead Township.

READING, PA. — The Berks-Lehigh Electric Company has been organized to take over and merge the Lynn Township, Krumsville and Kempton Electric companies. The new company plans extensions to its system.

BALTIMORE, MD.—The Calvert Building & Construction Company, Calvert Building, will build an addition to its power plant. Henry Adams, Calvert Building, is architect.

HAGERSTOWN, MD.—The installation of an ornamental lighting system on West Franklin and East Washington Streets is contemplated at a cost of about $9,000. A. B. Grubmyer is superintendent of the municipal electric light plant.

GILBERT, W. VA.—The Gilbert Water & Light Company, recently organized with a capital stock of $25,000, contemplates the installation of electric light and water systems. Electricity will be furnished by the Kentucky & West Virginia Power Company of Logan. J. A. Berry is treasurer and general manager of the new company.

ALEXANDRIA, VA.—Steps have been taken by the Chamber of Commerce to secure the installation of an ornamental lighting system on King Street, to cost about $12,000.

WASHINGTON, D. C.—Bids will be received at the office of the Chief Signal Officer, War Department, until March 4, for 8,500 ft. of wire, SC type, W-18. (Circular R9388-A12 CP.)

WASHINGTON, D. C.—The Treasury Department, Auditors' Building, will take bids until March 15 for supplies for the fiscal year from July 1, 1922, to June 30, 1923, as follows: Class 6, electrical and engineering supplies; Class 15, incandescent electric lamps.

North Central States

GREENVILLE, MICH.—A power plant will be built in connection with a canning factory to be erected by the Michigan Canned Food Company, 817 Book Building, Detroit, in Greenville, to cost about $150,000. The Industrial Construction Company, Eau Claire, Wis., is preparing plans.

LANSING, MICH.—Work will soon begin on the erection of the proposed municipal electric plant, general contract for which has been let to Frank H. Davis, 1838 Penobscot Building, Detroit. The plant will have a capacity of 55,000 kw. and will cost about $1,500,000.

OWOSSO, MICH.—The City Commission is considering the construction of a municipal electric light plant to be operated in connection with the municipal waterworks.

POWERS, MICH. — The Consumers' Power Company, Jackson, will begin work at once on a power plant at Powers, to replace the station recently destroyed by fire. The cost is estimated at $400,000.

CLEVELAND, OHIO.—The City Council has requested an estimate prepared for the installation of an ornamental lighting system on West Twenty-fifth Street from the New York Central & St. Louis Bridge to Woodbridge Avenue. The Council has also authorized the installation of electric lamps on various streets in the city.

PORT CLINTON, OHIO.—The Northwestern Ohio Railway & Power Company contemplates the erection of new transmission and distributing lines on certain highways in Carroll and Erie Townships. Application has been made for a franchise for the erection of new transmission lines in Danbury and Catawba Island Townships.

OWENSBORO, KY.—The municipal electric light plant is reported to have been destroyed by fire.

WEST POINT, KY.—The Louisville Gas & Electric Company has obtained franchises to furnish electricity in West Point.

CONNERSVILLE, IND.—The Interstate Public Service Company, Indianapolis, is preparing a report relative to plans for further development of the power possibilities of a hydraulic canal through Connersville. The plans under consideration call for deepening the canal and equipping it with hydraulic turbines at three points. The question of installing a waterpower plant or a steam plant will also be considered. The company is planning to erect a 33,000-volt transmission line to connect Connersville and Newcastle. The present line to Cambridge City will be changed to the same voltage and a new line will be erected between Cambridge City and Newcastle. William Insull is manager.

NEWCASTLE, IND.—A power house will be built at the Indiana Village for Epileptics, near Newcastle, in connection with the new erection of buildings, at the institution, to cost about $300,000. Dr. W. C. Van Nuys is superintendent.

NOBLESVILLE, IND.—The Noblesville Heat, Light & Power Company has applied to the Public Service Commission for permission to issue $40,000 in stock, the proceeds to be used for extensions and improvements.

AURORA, ILL.—The Chicago, Burlington & Quincy Railroad, Chicago, is preparing plans for the erection of a power plant at Aurora, to cost about $100,000. William T. Krausch is architect.

PESHTIGO, WIS.—Budget appropriations for 1922 amounting to $825,000 have been granted to the Wisconsin Public Service Company, Green Bay, for new construction, equipment and development. The plans include the erection of a 6,200-hp. hydro-electric plant at Johnson Falls on the Peshtigo River near Peshtigo, to cost about $500,000. Bids, it is understood, will be asked about March 1 by Mead & Seastone, Madison, consulting engineers. C. R. Phenecie, Green Bay, is vice-president and general manager.

FRAZEE, MINN.—The Otter Tail Power Company, Fergus Falls, is receiving bids for materials for approximately 40 miles of three-phase, 40,000-volt transmission line extending from Frazee to the towns of Detroit, Audubon, Lake Park and Hawley. The cost of the equipment is estimated at $100,000. Construction will be started about April 15. C. S. Kennedy is vice-president and general manager.

MINNEAPOLIS, MINN.—The Northern States Power Company is arranging for line extensions to furnish service to Valley Springs, Lester, Beaver Creek and Ellsworth.

RED WING, MINN.—The City Council has adopted an ordinance authorizing the construction of a municipal electric light and power plant, for which bonds to the amount of $350,000 have been voted.

RUTLAND, IA.—The Union Utilities Company will soon call for bids for the construction of a hydro-electric power plant, estimated to cost about $150,000. Toltz, King & Day, Inc., 1410 Pioneer Building, St. Paul, Minn., is engineer.

WATERLOO, IA.—The Roth Packing Company contemplates building a power house at its local plant.

JOPLIN, MO.—The Ozark Power & Water Company is considering issuing $2,000,000 in bonds, part of the proceeds to be used for extensions and improvements to its plant and system.

ST. JOSEPH, MO.—At an election to be held April 11 the proposal to issue $300,000 in bonds for extensions to the municipal electric light plant will be submitted to the voters.

CLAY CENTER, KAN.—The Williamson power plant and dam on the Republican River at Clay Center has been purchased by the United Light & Power System. The new owners plan improvements to the property.

DOWNS, KAN.—The United Light & Power Company contemplates the erection of a new power plant, 50 ft. x 77 ft., in Downs.

HAMILTON, KAN.—The Council has awarded a contract to the Merkle Machinery Company, Kansas City, Mo., for the construction of a transmission line from Madison to Hamilton, about 11 miles, for local service. F. E. Devlin, El Dorado, Kan., is consulting engineer.

LUCAS, KAN.—The Council has approved a bond isue of $15,000 for the construction of a transmission line for local light and power supply.

LURAY, KAN.—The Council is considering the erection of a transmission line to secure electricity for local service.

McCRACKEN, KAN.—Bids will be received by the city of McCracken, care of L. L. Ryan, city clerk, about March 1, for power plant, two motor-driven pumps and two oil-engines, Diesel or semi-Diesel type. The Ruckel Engineering Company, Hutchinson, is engineer.

TOPEKA, KAN.—Steps have been taken by property owners on Topeka Boulevard for the installation of an ornamental lighting system on that thoroughfare from Fourth Avenue to Seventh Street. W. H. Kemper, 723 Topeka Boulevard, is interested.

Southern States

FORT PIERCE, FLA.—A power plant will be erected at the proposed new sugar mill to be built in this section by the Gulf Sugar Corporation. The Jamestown Electrical Engineering Corporation, Jamestown, N. Y., is in charge.

LEESBURG, FLA.—The Ocklawaha Reclamation Farms is planning the erection of from 20 to 30 miles of transmission lines to connect Leesburg and other cities. J. D. Young, Leesburg, is engineer.

TAMPA, FLA.—An electric street-lighting system will be installed in nine different sections of the city, replacing present gas lamps. A. W. D. Hall is city manager.

WEST PALM BEACH, FLA.—Plans are under consideration for improvements to the electric light plant and waterworks system, for which $75,000 in bonds has been authorized. Karl Riddle is city manager.

ALTOONA, ALA.—The City Council is considering the construction of electric light and water plants.

NEWTON, ALA.—The Houston Power Company will build a new transmission line from Hartford to Geneva, Ala., about 11 miles, for electrical service in Geneva.

BATESVILLE, ARK.—Improvements to the electric light and water plant, to cost about $25,000, are under consideration by the City Council.

CHARLESTON, ARK.—The City Council has granted to E. C. Linly a franchise to construct an electric plant in Charleston.

OPELOUSAS, LA.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until March 14, for wiring, etc., at the United States Post Office, Opelousas.

BROWNFIELD, TEX. — The Council contemplates improvements to the electric light system, for which $34,000 in bonds have been voted.

DALLAS, TEX.—The Dallas Power & Light Company has applied to the city for permission to change a present one-phase and two-phase distributing system to three-phase; construction of a transmission line to connect with the system of the Texas Power & Light Company; new transmission line to the Terrell district and additional reserve power line connecting with the Jackson Street power plant. The cost is estimated at about $167,000. C. W. Davis is general manager.

VERNON, TEX.—The City Commissioners have authorized plans prepared for a municipal electric power plant, for which bonds recently were voted.

MEXIA, TEX.—An election will soon be held to vote on the proposal to issue $800,000 in bonds for public improvements, including electric lighting system, incinerator, jail, purchase of the waterworks system at $112,500, and improvements to same, to cost about $300,000.

Pacific and Mountain States

PUYALLUP, WASH.—The City Council is considering the construction of a municipal power plant.

TACOMA, WASH.—The City Commissioners are considering the installation of an ornamental lighting system and the removal of poles and wires on Commerce Street from South Seventh to South Seventeenth Street.

FRESNO, CAL.—The San Joaquin Light & Power Corporation Fresno, and the Southern California Edison Company, Los Angeles, have made joint application to the Railroad Commission for approval of a contract whereby the San Joaquin company agrees to furnish to the Edison company 80,000,000 kw.-hr. of electricity between Aug. 1, 1922, and June 1, 1923. A new unit, consisting of a 20,000-hp. Allis-Chalmers turbine and generator, to cost about $1,250,000, will be installed to serve the Edison company.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Corporation has plans under consideration for extensive improvements to its electric and gas systems. The company has applied to the State Railroad Commission for permission to issue $2,000,000 in stock.

MODESTO, CAL.—The board of directors of the Modesto Irrigation District has engaged Louis F. Leurey, electrical engineer of San Francisco, to investigate the cost of the distribution of electricity to be generated at the Don Pedro Dam, now under construction.

PLACERVILLE, CAL.—The El Dorado Power Company a subsidiary of the Western States Gas & Electric Company of Stockton, has been authorized by the Federal Power Commission to build a 100,000-hp. hydro-electric plant on the south fork of the American River in the vicinity of Placerville. The project includes six storage reservoirs on the headwaters of the river, with an ultimate capacity of 90,000 acre-ft.

SAN FRANCISCO, CAL.—The California-Oregon Power Company, San Francisco, has had plans prepared for the extension of its high-tension transmission line north from Algoma to Chiloquin, a distance of 22 miles, to cost about $75,000.

SESPE, CAL.—The Sespe Light & Power Company has entered into an agreement with the Shattuck Construction Company whereby the latter will undertake financing the construction of the light and power company's water-power and irrigation projects on the Sespe and Piru Rivers in Ventura County, and in consideration of this the Shattuck company is to receive a half interest in all the properties now owned and controlled by the Sespe company. The unit to be developed includes what is known as the Hammel reservoir and power plant, the Bradfield reservoir and main power plant and the Kellerman dam. The total capacity of this first unit will be 30,500 hp.

BOISE, IDAHO.—The City Council plans for the construction of a new hydro-electric power plant on the north and south forks of the Fayette River, with an initial capacity of about 8,000 hp., later to be increased to 12,000 hp. Permission has been received from the Federal Power Commission, Washington, to utilize the site and water power.

STOCKTON, CAL.—The Western States Gas & Electric Company, Elks' Building, is planning to erect a new transmission line from Stockton to Lodi, Cal., to cost about $70,000. Samuel Kahn is general manager.

DENVER, COL.—The Denver Gas & Electric Light Company has arranged for a bond issue of $3,000,000, part of the proceeds to be used for extensions and improvements to its system.

FORT BAYARD, N. M. — Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until March 6 for lighting fixtures for the Public Health Service Hospital Fort Bayard.

Canada

BRIGHT, ONT.—The establishment of an electric light and power plant in Bright is under consideration. George Oliver is clerk.

COURTRIGHT, ONT.—A bylaw authorizing $11,000 for the erection of a transmission line to Courtright has been approved by the ratepayers. The line will be extended from Sarnia.